TIME CRITICAL REMOVAL PLAN

FOR THE

TOLEDO TIE TREATMENT SITE

LOCATED AT

ARCO INDUSTRIAL PARK
TOLEDO, OHIO

JULY 1998

Prepared For:

KERR-McGEE CHEMICAL, LLC
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July 10, 1998

Mr. Ralph Dollhopf, On-Scene Coordinator
United States Environmental Protection Agency
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Ms Deborah Orr, Remedial Project Manager
United States Environmental Protection Agency
77 W. Jackson Boulevard (SE-4J)
Chicago, Illinois 60606-3950

RE: Toledo Tie Treatment Site, Time Critical Removal Plan
PWM001.100.0064

Dear Mr. Dollhopf and Ms. Orr:

Enclosed is a plan set and supporting document, Time Critical Removal Plan, which is being submitted pursuant to our discussions in June, 1998. These documents describe Kerr-McGee Chemical's, LLC, (KMC) approach to address the migration of creosote related contamination to Williams Ditch and the surface of Frenchmens Road at the Toledo Tie Treatment Site in Toledo, Ohio. We trust that the enclosed information is consistent with our discussions.

Please feel free to contact Peter Goetz, KMC project coordinator or me with questions or if you require additional information.

Sincerely,

Scott Lockhart, P.E.

SFl/jlj

Enclosure

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TIME CRITICAL REMOVAL PLAN
TOLEDO TIE TREATMENT SITE

TABLE OF CONTENTS

TIME CRITICAL REMOVAL PLAN
TOLEDO TIE TREATMENT SITE

TABLE OF CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF PLATES

1.0 INTRODUCTION

Kerr-McGee Chemical Corporation, now known as Kerr-McGee Chemical, LLC (KMC), was issued a Unilateral Administrative Order (UAO), on December 24, 1997, pursuant to Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The UAO pertains to the Toledo Tie Treatment Site (Site) located in and near the Arco Industrial Park in Toledo, Ohio. Section V, Item 3.5) and Item 3.7) of the UAO dictate that KMC:

> *Remove the immediate source areas of hazardous substances or implement engineering controls to prevent the contamination in the source areas from migrating to Williams Ditch and to the surface of Frenchmens Road,* and
>
> *Remove coal tar creosote contamination from Williams Ditch sediments and/or implement additional engineering controls to prevent continued release of contaminants to Williams Ditch.*

KMC has entered into contract negotiations with OHM Corporation (OHM) to complete these time critical activities at the Site. A qualified backup contractor has been identified should KMC not reach agreement with OHM. Pending the approval of a work plan, the final scope of work with the contractor will be negotiated. This work plan has been prepared by Hull & Associates, Inc. (HAI) on behalf of KMC to describe KMC's proposed approach to comply with the UAO.

1.1 Report Organization

This Work Plan is organized into four sections. Section 1.0 presents an overview of the project history and the status of removal activities at the site. Section 2.0 includes a summary of the field investigations conducted at the Site in accordance with the approved Removal Action Work Plan (HAI, April 1998). Section 3.0 provides the rationale for the selected remedy. Section 4.0 addresses the implementation of the remedy and provides a framework for finalizing a contract with the selected remedial contractor.

1.2 Site Description

The Site encompasses over 50 acres and is located in the City of Toledo, Lucas County, Ohio, as shown on Figure 1. The Site was a railroad tie treating facility owned and operated by Federal Creosoting Company (FCC) from approximately 1923 to 1959, and the American Creosoting Corporation (ACC) from 1959 to 1962. Operations ceased in 1962 when the Site was sold to the City of Toledo. In 1969, the Site was sold to Arco Realty, Inc., who subdivided the Site into a number of parcels and developed the area into a business and industrial park.

While operated by FCC and ACC, wooden railroad ties were treated with coal tar creosote at the Site. A site map of the general wood treating operations is shown on Plate 1 in Appendix A. Based on a review of aerial photographs from years 1950, 1957, 1963 and 1969, it appears that untreated lumber was stored on the eastern section of the Site, and treated wood was stored on the western section of the Site. An above ground tank farm was located in the central southern section of the Site, south of the old access road formerly known as Creosote Road. The Ohio Environmental Protection Agency (OEPA) reported in the Site Inspection report (SI, 1993) that the tank farm consisted of two 500,000 gallon, three 30,000 gallon, and four 150,000 gallon creosote tanks, and one 150,000 gallon zinc chloride tank. Suspected waste lagoons are located in the central section of the Site, north of the access road. The suspected lagoons are located east of Arco Drive. One is directly under and two are south of the current location of Frenchmens Road. Based on a review of aerial photographs, it appears that the suspected lagoons were filled between 1969 and 1972. A currently unoccupied distribution warehouse is currently situated over a portion of one of the suspected lagoons.

Williams Ditch serves as the natural drainage in the area. When the Site operated as a wood treating facility, the ditch ran southwest to northeast along the western section of the Site. The ditch generally intersected what are now known as Arco Drive and Frenchmens Road, at approximately a 45-degree angle. A review of aerial photos indicates the impacted portion of the ditch was rerouted to its current location during the redevelopment of the area.

The Site (see Figure 1) is located on a relatively level piece of property approximately 4,500 feet north of Swan Creek and 8,000 feet south of the Ottawa River. The Site gently slopes toward Williams Ditch, which crosses the Site from southwest to northeast. Elevations across the site range from 620 to 625 mean sea level (msl). Elevations are referenced to the Lucas County Datum.

The Site lies within the Eastern Lake Plains of the Central Lowland physiographic province of North America. This glaciolacustrine landscape typically possesses low relief and low elevation. This flat surface was created due to several widely spaced periods of continental glaciation that supplied the largely unsorted, unstratified surficial drift deposits that cover the land in this area of the state. During the most recent stages of ice retreat, released water became trapped between the retreating ice mass to the north and the glacial deposits to the south and proglacial lakes formed. These lakes produced a thin veneer of lacustrine deposits over the glacial tills.

More specifically, the surficial lacustrine deposits consist of two distinct types: silt and clay deposits representing quiet water deposition; and sand deposits representing higher energy environments (i.e. near shore). The lacustrine deposits are approximately 12 to 14 feet thick at the Site and range from silt to clay to sand.

The Ohio Department of Natural Resource (ODNR), Division of Geological Survey, Drift Thickness Map of Lucas County, Ohio (ODNR, 1985) indicates that the Site sits on the southern slope of a buried valley where the drift thickness is approximately 125 feet. The buried valley trace is from the southwest to the northeast and reaches a maximum depth of approximately 150 feet north of the Site. The glacial drift overlies Devonian limestone or dolomite bedrock.

The ODNR Ground-Water Resources Map of Lucas County indicates that the principal aquifer beneath the Site is a thin, discontinuous sand and gravel lenses interbedded in the clay till filling the preglacial valley. Yields of approximately 10 to 20 gallons per minute (gpm) are encountered at depths of 120 feet or less.

Higher yields may be obtained from the underlying carbonate aquifer. The area in the vicinity of the Site is served by a municipal water supply system, and local use of ground water for potable consumption is expected to be minimal or non-existent.

1.3 Status of Site Removal Activites

A number of environmental investigations were conducted at the Site from 1987 to 1995. Key documents describing site conditions include the "Initial Investigation and Preliminary Risk Assessment" report dated June 27, 1990, by Midwest Environmental Consultants, "The Hydrogeology and Creosote Contamination of an Abandoned Wood Preserving Plant Site at Toledo, Ohio," report dated December 1995, by Greg Victor Lesniak of the University of Toledo, and the 1993 Ohio EPA Site Inspection Report (SI). Results of soil, groundwater, and surface water samples collected from the Site during these investigations indicated contamination from creosote compounds existed near the suspected lagoons, former process area, and Williams Ditch. Some of the major individual polynuclear hydrocarbons (PAHs) detected were naphthalene, benzo(a)pyrene, phenanthrene, chrysene, fluoranthene, acenaphthalene, pyrene, and dibenzo(a,h)anthracene. Concentrations were detected in the range of 100s to 1,000s of parts per million (ppm) in the soil, sediment, and surface water. Investigations conducted by Ohio EPA in 1993, and the Ohio Department of Health in 1995, determined that sediments in some areas of Williams Ditch were saturated with creosote.

On September 25, 1997, following a significant rain event in Toledo, Ohio, the National Response Center was notified of the presence of a sheen of an unknown oil in Williams Ditch. On October 1, 1997, representatives of the U.S. EPA Emergency Response Branch evaluated conditions in Williams Ditch and observed an oil sheen upgradient of the National Super Service storm sewer outfall to Williams Ditch. U.S. EPA documented that the sheen was heavy in the ditch east of Arco Drive (50 to 100 feet) and north (50 to 100 feet) of the location of the suspected creosote lagoon areas. This area of heavy sheening is where a storm sewer apparently runs through the suspected lagoon area to Williams Ditch.

At the request of the U.S. EPA, KMC initiated abatement activities to preclude sheen migration in Williams Ditch on October 10, 1997, and continued these efforts until the issuance of the UAO. Pursuant to the terms of the UAO, KMC prepared work plans for conducting field investigations for the time critical phase and for the Engineering Evaluation/Cost Analysis (EE/CA). A site specific Health & Safety Plan (HASP) was also prepared, which addressed anticipated removal activities. Field investigations to collect data on surface water, soil, sediment, and air at the site were conducted between April 27, 1998 and June 1, 1998, in accordance with the Removal Action Work Plan (HAI, April 1998, approved by the U.S. EPA on April 29, 1998). These investigations are briefly described in Section 2.0. Currently, creosote related contamination that accumulates on the surface of water in Williams Ditch is recovered on a weekly basis. Two siphon dams were constructed and are functioning as intended to control the downstream migration of visible oil and oil sheen in Williams Ditch. The site has been secured with high-visibility fencing and warning signs. Support facilities and equipment, including a site trailer and a dedicated tractor to maintain the grass, have been mobilized. Site visits are conducted on a regular basis to document the site's security status and to conduct perimeter ambient air monitoring.

2.0 SUMMARY OF INITIAL FIELD INVESTIGATIONS

HAI completed the initial field investigation of the project area from April to June 1998 in accordance with the Field Sampling and Analysis Plan (FSAP) (HAI April, 1998). The objective of the initial field investigation was to determine the distribution of creosote related contamination in the suspected former lagoon area and to identify the immediate source of creosote related contamination migrating to Williams Ditch. Activities completed during the initial field investigation included:

1. Installation of sixty-five borings in the project area by Fugro Geosciences (Fugro) under the observation of an HAI representative. Borings CPT-1 through CPT-64 and BG-1 were installed using a cone penetrometer testing (CPT) probe and a laser-induced fluorescence (LIF) probe (see Plate 2 for CPT locations).

2. Installation of ten geoprobe borings (SB-1 through SB-10) and six test pits (TP-1 through TP-6) to allow for visual characterization of subsurface conditions in the project area, as well as to facilitate the collection of selected soil samples for chemical and geotechnical analysis (see Figure 2 for soil sampling locations).

3. Collection of five surface water samples (SW1 through SW4 and BG1) and fourteen sediment samples (SED-001 through SED-013 and SED-BG) to evaluate the quality of water and sediment within Williams Ditch, respectively (see Figure 3 for sediment and surface water sampling locations).

A map, showing the overall site, with environmental sampling locations, is provided as Plate 1 in Appendix A. A summary of each task is listed below, including a review of data collected:

2.1 Collection of Surface Water Samples

Five surface water samples were collected from Williams Ditch (BG1 and SW1 through SW4) by HAI representatives on May 12, 1998. Each of the surface water samples were collected as close as practical to the proposed locations presented in the FSAP, the locations of which are shown on Figure 3. Each sample was collected consistent with the procedures presented in the FSAP and submitted to Lancaster Laboratories, Inc. for chemical analysis. Environmental Standards, Inc. is performing data validatation. Results are pending. Provided on Table 1 is a summary of surface water sample collection activities, including time of collection, field parameters, and general notes associated with sample collection. Results of the chemical analysis of surface water samples are provided on Table 2.

A review of the chemical data indicates the highest parameter concentrations for surface water samples to be reported for surface water sample SW-2. As shown on Figure 3, surface water sample SW-2 was collected in close proximity to the former lagoon areas, and as discussed in Section 2.2, is located within the approximate extent of impacted shallow soils that have been determined to be potentially affecting the quality of surface water and/or sediment in Williams Ditch using the CPT/LIF data. Parameter concentrations reported for surface water samples collected both upstream and downstream of SW-2 were less than those reported for surface water sample SW-2.

2.2 Installation of CPT/LIF Borings

Sixty-five borings were installed by Fugro from April 27 through April 30, 1998 under the observation of an HAI representative consistent with the FSAP. Borings CPT-1 through CPT-64 and BG-1 were installed in the project area to evaluate shallow stratigraphic conditions and to identify the approximate extent of impacted shallow soils. The CPT/LIF borings were also installed to determine if impacted shallow soils were affecting the quality of water and/or sediment in Williams Ditch. Each of the borings were installed using direct push technology to advance CPT and LIF probes until the underlying silt- and clay-rich lacustrine deposits blanketing the project area were encountered and the full thickness of LIF response above background within the shallow soils was identified. Locations of the CPT/LIF borings were selected to allow for

evaluation of the extent of impacted soils and are shown on Plate 1. Boring BG-1 was installed to allow for consideration of background conditions while interpreting the CPT/LIF data. CPT/LIF logs developed by Fugro are provided in Appendix B. Plate 2 documents the LIF signature thickness based on the CPT/LIF logs.

Cross-sections A-A', B-B', C-C' and D-D', which are shown on Plates 3, 4, and 5, provide an interpretation of shallow stratigraphic conditions encountered in the project area based on data obtained via installation of the CPT/LIF borings. Included on the cross-sections are the approximate limits of the former lagoon areas, Williams Ditch and the LIF response above background (as appropriate). Also provided on the cross-sections are the approximate locations of utilities in the project area and a cross-section profile line location map. As shown on the cross-sections, the project area is characterized by an upper zone of primarily sand/silt/clay deposits most likely associated with reworking of the surficial soils as part of filling operations. Some of the sand/silt zones identified by the CPT/LIF borings in the upper zone may be associated with in-situ deposits that have been documented to be present in the vicinity of the project area. Beneath the sand/silt/clay deposits is a laterally continuous silt/clay deposit that has been identified to represent the lacustrine deposits that blanket the project area. Within the silt/clay deposits are silt/sand/clay zones that most likely correspond to thin granular seams/lenses typically encountered in the lacustrine deposits in the region.

A review of the LIF data presented on the CPT/LIF borings was completed to identify depth intervals representing the LIF response above background. The thickness of LIF signature above background (measured in feet below ground surface) was identified for each CPT/LIF boring to determine the thickness of LIF signature above background across the project area. As shown on Plate 2, the thickest intervals of LIF signature above background were, in general, encountered in the vicinity of the former lagoon areas. Minimum LIF responses above background ranged from zero at several locations, to a maximum thickness of approximately eleven feet at boring CPT-46 near the approximate northeast corner of the former lagoon overlain by Frenchmens Road. Cross-sections A-A' through D-D' also provide an illustration of the LIF signature above background within shallow soils in the project area. As shown, LIF signatures above background are mostly

encountered in the upper sand/silt/clay deposits, and occasionally extend to greater depths within the underlying lacustrine silt/clay deposits where sand/silt/clay seams and/or utilities may serve as preferential pathways.

A review of the CPT/LIF logs contained in Appendix B, cross-sections A-A' through D-D', and the LIF signature thickness map provided as Plate 2 indicates that the CPT/LIF borings were successful in providing an understanding of shallow stratigraphic conditions in the project area, as well as identifying the approximate extent of impacted shallow soils affecting the quality of water and/or sediment in Williams Ditch. As shown on Plate 2, the approximate extent of impacted shallow soils has been defined using the LIF data. As shown, the quality of sediment and/or water within Williams Ditch may be affected by impacted shallow soils in the vicinity of borings CPT-17/17A, CPT-18, CPT-19 and CPT-33 installed directly adjacent to the south/east bank of Williams Ditch. The approximate western extent of impacted soils as identified using the CPT/LIF borings has been determined to be between borings CPT-19 and CPT-20, while the approximate eastern/northern extent has been determined to be between borings CPT-33 and CPT-35.

2.3 Installation of Geoprobe Borings and Test Pits

Ten geoprobe borings designated SB-1 through SB-10 were installed by Terra Probe on May 6, 1998 under the observation of an HAI representative. The geoprobe borings were installed in the project area to allow for a visual description of subsurface conditions, as well as to facilitate the collection of soil samples for chemical and geotechnical analysis. Each of the geoprobe borings was installed immediately adjacent to a previously installed CPT/LIF boring, as summarized on Table 3, to allow for a comparison of CPT/LIF data to data obtained via installation of the geoprobe borings. Locations of the geoprobe borings are shown on Figure 2. Logs are found in Appendix C.

One soil sample from each geoprobe boring (i.e., total of ten samples) was submitted to Lancaster Laboratories, Inc. for chemical analysis to demonstrate compliance with the 10% confirmatory sampling requirement specified in the FSAP. The locations of samples submitted for chemical

analysis were selected based on a review of LIF data, with each sample depth selected from the interval representing the LIF response above background. In general, samples were collected from shallow soils immediately above the silt- and clay-rich lacustrine deposits blanketing the project area, as a review of the CPT/LIF data indicated that, in general, the LIF signature above background appeared to be limited to shallow soils above the silt- and clay-rich lacustrine deposits (excluding locations where no LIF signature above background was identified). Results of the chemical analysis completed by Lancaster Laboratories, Inc. are provided on Table 4.

A review of the chemical data indicates the highest parameter concentrations to be reported for soil samples collected from within the approximate former lagoon areas. Soil samples collected from geoprobe borings SB-8 (CPT-48), SB-9 (CPT-16) and SB-10 (CPT-58) exhibited the highest parameter concentrations (in general) and are located within the approximate former lagoon areas. Elevated parameter concentrations were also reported for samples collected at geoprobe borings SB-4 (CPT-57) and SB-7 (CPT-56) located immediately adjacent to the former lagoon areas. The soil sample collected from geoprobe boring SB-5 (CPT-4) exhibited lower parameter concentrations than those reported for samples collected from nearby borings SB-8 (CPT-48) and SB-9 (CPT-16) installed within the former lagoon areas, which lends support to soil boring SB-5 (CPT-4) being located between two separate former lagoon areas.

Consistent with the FSAP, test pits TP-1 through TP-6 were installed by Heritage Environmental Services, Inc. (Heritage) on May 7, 1998 under the observation of an HAI representative. As shown on Figure 4, the test pits were installed in close proximity to previously installed CPT/LIF borings to allow for visual characterization of subsurface conditions. Data obtained via installation of the test pits were used in addition to the geoprobe borings to further evaluate the CPT/LIF data. Test pit logs are contained in Appendix C, and a summary of installation data associated with the test pits is provided on Table 5.

As previously stated, the geoprobe borings and test pits were installed to allow for an evaluation of the validity of data obtained via installation of the CPT/LIF borings. Soils encountered during the completion of geoprobe and test pit installation activities were visually characterized by an HAI

hydrogeologist. A review of data collected during the initial field investigation indicates that good correlation exists between the CPT/LIF borings, geoprobe borings and test pits. As part of this evaluation, each of the geoprobe logs were reviewed by Fugro, with the overall conclusion being that, in general, good correlation between the geoprobe borings and CPT/LIF borings exists.

2.4 Collection of Sediment Samples

Fourteen sediment samples were collected from Williams Ditch (SED-BG and SED-001 through SED-013) by HAI representatives from May 12 to May 15, 1998. Each of the sediment samples were collected at the proposed locations presented in the FSAP. Sediment sample locations are shown on Figure 3. Each sample was collected consistent with the procedures presented in the FSAP and submitted to Lancaster Laboratories, Inc. for chemical analysis. Table 6 is a summary of sediment sample collection activities, including date/time of collection and general notes associated with sample collection. Results of the chemical analysis of sediment samples are provided on Table 7.

A review of the chemical data indicates the highest parameter concentrations for sediment samples to be reported was for sediment sample SED-005. Sediment sample SED-005 was collected in close proximity to the former lagoon areas and surface water sample SW2, and as discussed in Section 2.2, is located within the approximate extent of impacted shallow soils that have been determined to be potentially affecting the quality of surface water and/or sediment in Williams Ditch. Sediment samples SED-004 and SED-006 collected upstream and downstream of sediment sample SED-005, respectively, indicate decreasing parameter concentrations. Sediment sample SED-004 was collected from the approximate western (i.e., upstream) extent of impacted shallow soils as determined using the CPT/LIF borings, with decreasing parameter concentrations reported for sediment samples collected further upstream. Similarly, sediment sample SED-6 was collected downstream from the approximate extent of impacted shallow soils, with sediments samples collected further downstream exhibiting parameter concentrations significantly less than those reported for sediment sample SED-005.

3.0 RATIONALE FOR TECHNICAL APPROACH

Section IV, Item 6 of the Unilateral Administrative Order (UAO) identifies the primary factors, pursuant to Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), driving the implementation of time critical removal activities at the Toledo Tie Treatment Site. The proposed remedy addresses these driving forces by mitigating potential migration and exposure pathways through source removal and engineering controls. Components of the time critical removal activities include:

1. Excavation of sediment to remove the most immediate source of contamination to the waters of Williams Ditch.
2. Excavation of immediate source areas and migration pathway(s).
3. Modifications to the infrastructure to mitigate impacts caused by source removal and to eliminate the primary migration pathway to Williams Ditch.
4. Installation of a subsurface barrier system with a french drain to control future migration to Williams Ditch and to address areas of residual contamination.

The proposed remedy was selected because:

1. Creosote related contamination in the sediments accumulated in Williams Ditch was confirmed by sampling and geochemical data. Removal of this source of contamination to the water in Williams Ditch was considered the most effective option in preventing continued contamination.
2. The immediate source of the creosote contamination to the sediments and waters of Williams Ditch is identified as the two, westernmost lagoons. Creosote related contamination was confirmed in the soil in these areas and a direct migration pathway from these areas to the ditch was identified.

3. Removal of the storm sewer and construction of the french drain will significantly reduce the potential for creosote migration to Williams Ditch and provide a mechanism for capturing residual creosote that remains after the immediate source has been removed.

Excavation of additional area should be considered

4.0 IMPLEMENTATION OF THE REMEDY

During the time critical removal process, the immediate source areas will be excavated, infrastructure will be removed and replaced as needed, sediment in Williams Ditch will be excavated, and a subsurface barrier system will be constructed. The following is a brief description of the activities required to implement these tasks.

4.1 Lagoon Excavation and Infrastructure Removal

KMC's expectation is that if transportation and disposal of excavated materials is chosen, Peoria Disposal Company, (PDC) in Peoria, Illinois will be the preferred off-site disposal facility. If thermal desporption is reasonably achievable, available, and is competitive, thermal treatment could be an option. PDC has been used by KMC for previous projects involving wood treatment sites and is in compliance with §300.440 of the National Contingency Plan. KMC will contract directly with PDC for disposal of contaminated material. Excavated soils/sediments will be classified as F034 under 40 CFR, Subpart D §261.31. The selected contractor will provide a full time on-site waste management coordinator to track transportation and disposal activities.

4.1.1 Excavation, Backfill, and Site Grading

The area indicated on Sheet 2 of the plan set will be excavated to the subsurface lacustrine clay layer which is at an average depth of approximately eight feet. There are several underground utilities located within the excavation area. Please see the plan set and Section 4.1.2 for details regarding excavating near these utilities and the removal and replacement of some of the utilities present.

An effort will be made to segregate the excavated soil by its level of visual contamination, if possible. The data show creosote related contamination resides within an upper sand/silt stratum and rests upon a lower confining layer of lacustrine silts/clays, typical of a dense, non-aqueous phase liquid (DNAPL) plume. Observations during test pit excavation were that the DNAPL was present in thin bands or seams within the sand/silt layer and was not distributed homogeneously through the stratum. The data support limiting the excavation to the limits shown on the drawings, considering the other controls that will be in place. The area will be backfilled in accordance with

the final grade indicated in the plan set. Where possible, native soils from the upper few feet, which are not visually contaminated with creosote, will be used to the degree practicable as backfill. This will be done in conjunction with the construction of the subsurface barrier system, the removal of the utilities as listed below, and the reconstruction of Frenchmens Road.

4.1.2 Utility Removal and Replacement

Refer to Sheet 3 of the plan set for all utility removal work. Storm sewer pipes #1 - #11 and all associated fixtures will be removed. Additional storm water controls will be installed, subject to City of Toledo concurrence with the proposed modifications, to insure the proper management of storm water in this area.

Columbia Gas's 4" low pressure gas line may be temporarily removed or isolated if needed to facilitate the excavation. It is currently anticipated that the underground Ameritech lines, water main, and sanitary sewers will not be removed. Sanitary, water and electric service must be maintained to the unoccupied distribution warehouse during and after removal activities. Coordination with Ameritech, Toledo Edison, and Columbia Gas will be necessary during the construction of the french drain. Toledo Edison will provide support during excavation activities to maintain the integrity of the existing above ground electrical service.

Potential migration pathways along subsurface utility corridors will be addressed by sealing around the pipes/trenches with a geosynthetic material or bentonite seal across the utility trench. This seal applies to the Columbia Gas service line (if applicable), the sanitary tap, the water tap and the below ground electrical conduit servicing the former Spartan building.

The utilities have been contacted and the project discussed with them. Any excavation, backfill, site grading, and construction activities performed near these utilities will need to be coordinated with the appropriate organizations.

4.1.3 Road Replacement and Removal

For a delineation of the portion of Frenchmens Road to be removed and replaced, refer to Sheet 3 of the plan set. Sheets 5 and 6 provide detailed information on the replacement road.

The removal of the storm sewer in this area necessitates the removal and replacement of this portion of Frenchmens Road to insure proper management of the surface water in the area. A drainage swale along the south side of Frenchmens Road is required to insure proper drainage of the area south of Frenchmens Road.

4.2 Sediment Removal

4.2.1 Sediment Excavation and Backfill

Two feet of sediment will be excavated from the portion of Williams Ditch that is delineated in the plan set. The terminus point will be halfway between SED-009 and SED-010. The area between SED-007 and SED-008 may require excavation upto 3.5 feet below existing ditch grade. Confirmation of excavation depth will be made using field flourescence techniques. Excavated areas will be backfilled with either general soil fill or lined with a flexible membrane liner and filled with gravel to the design grade prescribed in the City of Toledo's Comprehensive Ditch Plan. Field conditions at the time of excavation/backfill will dictate which method is selected.

4.2.2 Williams Ditch Rerouting

The contractor has proposed to isolate the ditch in sections to reroute the water around the sediment removal area. Alternately, placement of a sheet pile coffer west of Arco Drive and diverting flow past the terminus point may be used. The siphon dams will remain in place until it has been demonstrated by visual observation that the water in Williams Ditch is free of visible oil or oil sheen. Water will need to be rerouted during the sediment excavation, and soil backfill activities.

4.3 Subsurface Barrier (French Drain)

A french drain will be constructed to address the residual contamination that is not removed during the excavation portion of the time critical removal action and to provide a mechanism to protect sediment and surface water in Williams Ditch.

4.3.1 Excavation

The subsurface barrier will be installed once the storm sewer and associated backfill near Williams Ditch has been removed. Placing the subsurface barrier in the initial stages of the project provides the benefit of isolating the immediate source from Williams Ditch. See Sheet 4 in the plan set for construction details.

4.3.2 Construction

Sheet piling will be driven on both sides of the french drain. Then the area between the sheet piling will be excavated to the depth and grade indicated in the plan set. The geocomposite consisting of geonet surrounded by geotextile fabric will be attached to the permanent sheet piling and the geotextile fabric wrap, gravel, and pipe will be laid in place. The sump will be constructed and each leg of the french drain will be connected to the sump. Then, the excavation will be backfilled with clean soil to the final grade indicated in the plan set. Once the excavation has been backfilled, the temporary sheet piling will be removed.

4.3.3 Operation

Liquids entering the french drain pipes will drain to the sump. DNAPL which accumulates in the sump will be removed and water, once treated, is planned to be discharged to the City of Toledo sewer system. A Warren-Rupp, double diaphragm pump or similar, using a footer valve or similar set up will be used. The operational concept is to maximize the collection of creosote product and minimize water production. A float system, with a dial up alarm system to alert KMC of system in operation or excessive liquid level, will be incorporated. Alternately, a timer mechanism may be used if it proves more effective in drawing free product to the french drain. A timer mechanism may be preferable to a float system as maintenance could be become problematic due to product build up on the float(s).

4.4 Required Contractor Submittals

4.4.1 Site Specific Health and Safety Plan (HASP)

HAI has prepared a HASP addressing the requirements for the anticipated activities at the former Toledo Tie Treatment Site. This document is located in Appendix B of the Removal Action Work Plan. The minimum provisions of this plan are mandatory for all project personnel entering the site as well as site visitors. It should be acknowledged that the employees of other consulting and/or contracted companies may work in accordance with their own independent HASP's if it is more or as stringent as the one submitted by HAI. At a minimum, this document should be submitted to KMC for review prior to initiating any intrusive on-site activities.

The selected contractor is responsible for developing and implementing a HASP that addresses anticipated site health and safety concerns and specifically focuses on project tasks scheduled to be performed. The plan should also present required information including, but not limited to: identification of key personnel and lines of communication, training, medical surveillance, site hazards, work zones, personal safety, ambient and personal air monitoring, respiratory clearance, equipment cleaning and material safety data sheets, heat stress monitoring for permeable and non-permeable clothing, respirable contaminant action levels, levels of PPE, and emergency contingencies (i.e., injury, chemical release, etc.). Frequency and location should also be taken into consideration. As applicable, these criteria should be in document form and reviewed by KMC. Copies of training(s) should be tabulated and submitted as one bound document. Note all persons entering the site must show proof of OSHA 40-hr training, 8-hr refresher training, medical surveillance, and respirator clearance before they will be permitted to enter the site.

4.4.2 Stormwater Management Plan

The selected contractor will be responsible for ensuring that all stormwater is properly managed and segregated. Portable water holding tanks may be used to contain stormwater from excavations and, if needed, to serve as a holding mechanism for decontamination water.

4.4.3 Dust/Odor Control Plan

Visible dust emissions will be addressed by periodically applying misted water or using an equivalent approach. OHM has proposed to use a chemical deodorizer to control odors if need. A detailed plan describing engineering controls, traffic control measures, etc will be required.

4.4.4 Air Monitoring Plan

The contractor will be responsible for conducting ambient and personal air monitoring throughout the duration of all intrusive construction activities. Action levels, based upon site specific chemical data are being developed and will be incorporated as an amendment to the site HASP.

4.4.5 Dewatering/Stabilization Plan

The selected contractor will be required to submit a detailed plan for handling and management of contaminated sediments/soils. This plan must also include a liquids management program incorporating at a minimum, details for the recovery, management, treatment (if any), and disposal of potentially contaminated water. Anticipated sources of potentially contaminated water include, but are not limited, to decontamination water, water entering excavations or draining from excavated soils or sediments. The City of Toledo WWTP is the preferred receptor of potentially contaminated water from the site and negotiations are ongoing to provide this capacity.

4.4.6 Contingency Plan

The site contingency plan will be amended as needed to address such things as on-site or off-site spills of materials leaving the site, traffic emergencies, etc. The amended plan will be distributed to the parties previously contacted and prior to initiating construction, reviewed with them.

5.0 REFERENCES

A variety of technical documents, administrative documents, and publications were referred to during the preparation of this document. Some of the references consulted are presented below.

HAI. Removal Action Work Plan for the Toledo Tie Treatment Site, Hull & Associates, Inc. April 1998.

U.S.EPA. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. United States Environmental Protection Agency. 1983.

U.S. EPA. A Compendium of Superfund Field Operations Methods, United States Environmental Protection Agency. 1987.

American Society of Testing and Materials. "ASTM Standards Relating to Environmental Site Characterization", ASTM Publication Code Number: 03-418297-38, 1410 pp. 1997.

U.S EPA. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition. United States Environmental Protection Agency. 1986.

U.S. EPA. Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020. United States Environmental Protection Agency. 1983.

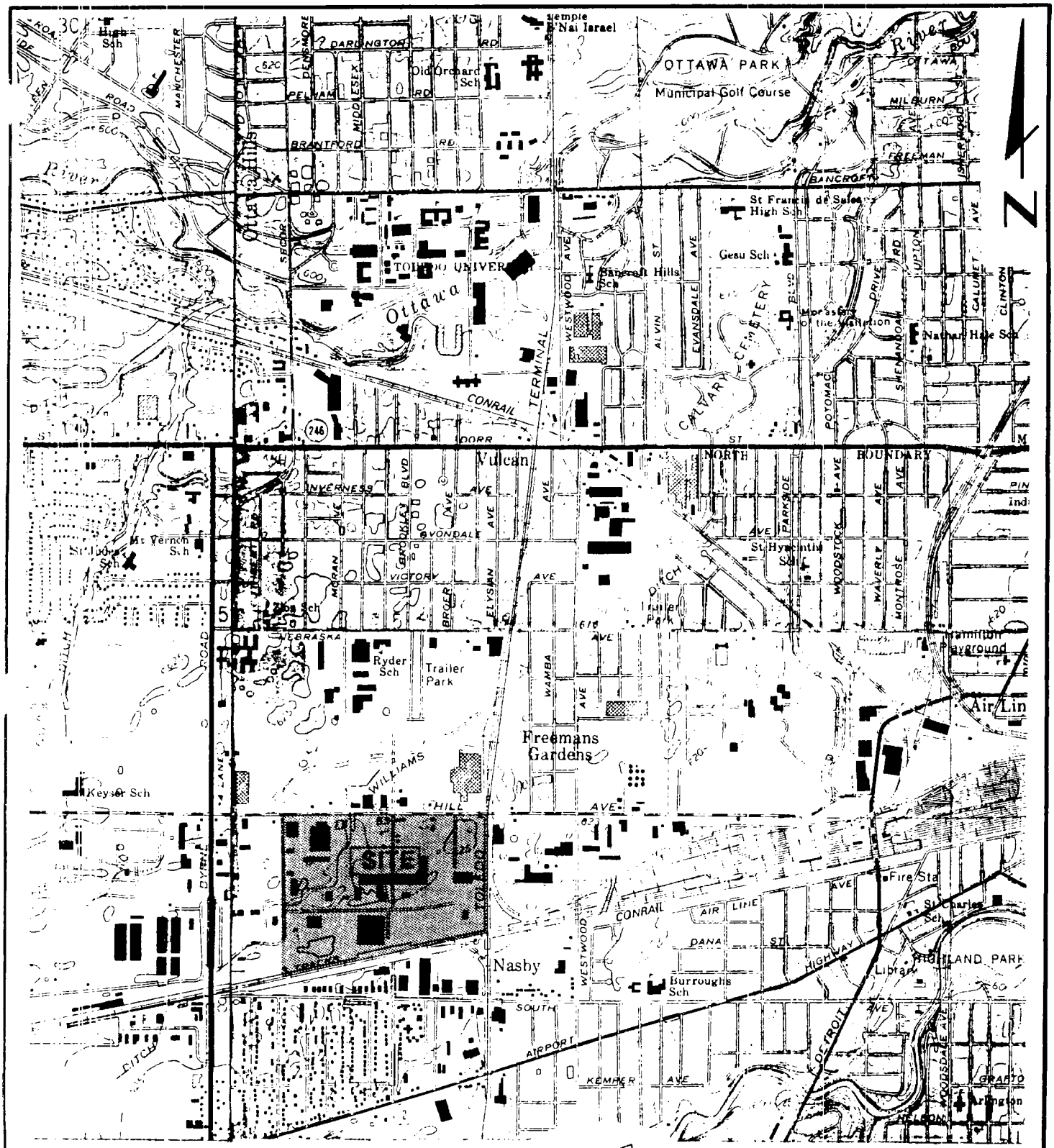
HAI. Appendix A. Field Sampling and Analysis Plan, Toledo Tie Treatment Site, Hull & Associates, Inc. April 1998.

HAI. Appedix C. Quality Assurance Project Plan, Toledo Tie Treatment Site, Hull & Associates, Inc. April 1998.

U.S. EPA. Approaches for Remdiation of Uncontrolled Wood Processing Sites, Office of Research and Development, United States Environmental Protection Agency, EPA/625/7-90/011, November 1990.

U.S. EPA. Presumptive Remedies, Technology Selection Guide for Wood Treatment Sites, Office of Solid Waste and Emergency Response, United States Environmental Protection Agency. EPA540-F-93-020, April 1993.

U.S. EPA. Contaminats and Remedial Options at Wood Processing Sites, Office of Research and Development, Risk Reduction Engineering Laboratory, EPA/600/R-92/182, October 1992.



QUADRANGLE LOCATION

0 1/2 MILE 1 MILE

1000 0 1000 2000 3000 4000 5000 FEET

0.5 0 1 KILOMETER

FIGURE 1

Hull & Associates, Inc.
TOLEDO, OHIO

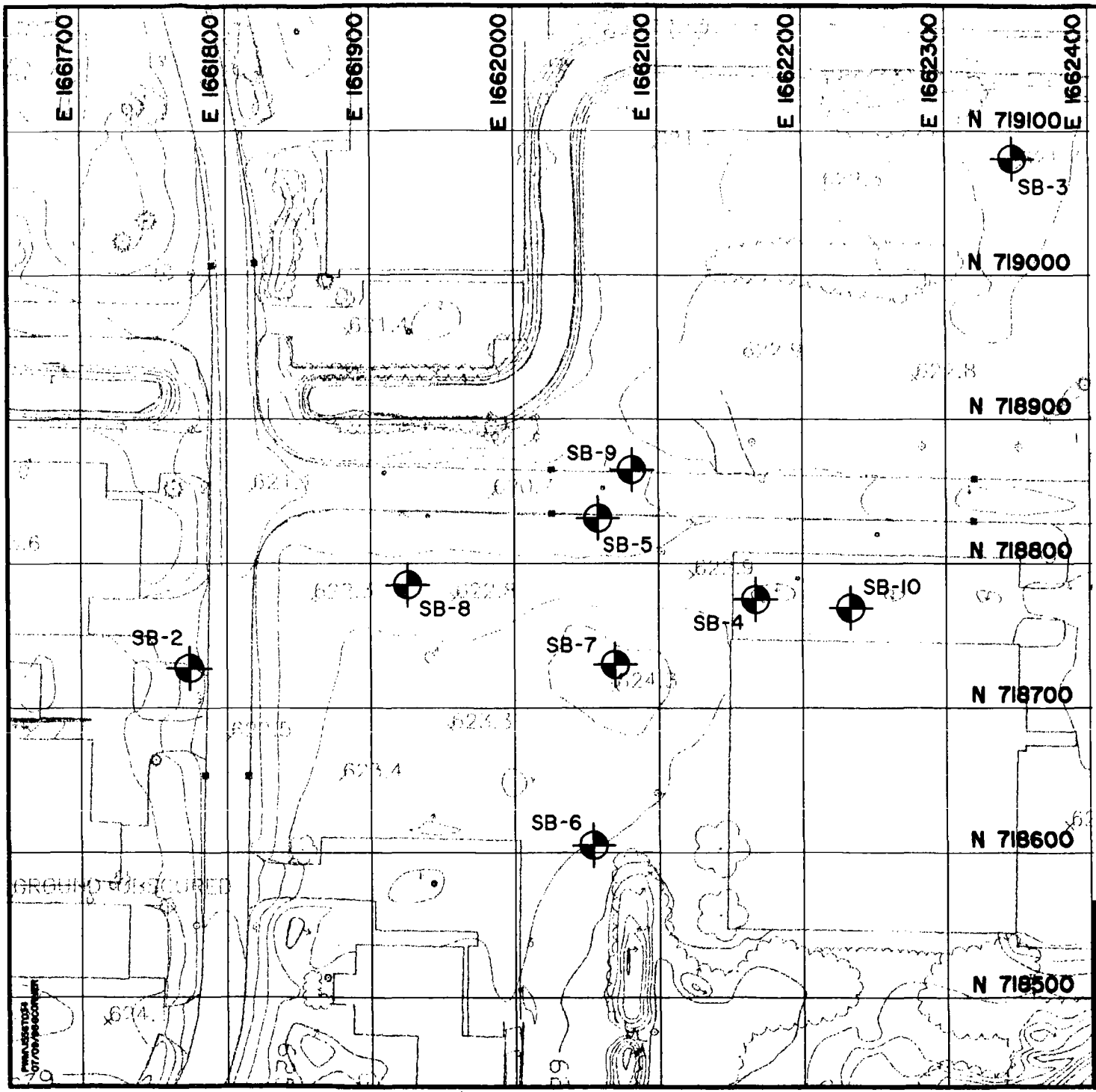
KERR-McGEE CHEMICAL, LLC.
TOLEDO TIE TREATMENT SITE
TIME CRITICAL REMOVAL PLAN

SITE LOCATION MAP

CITY OF TOLEDO, LUCAS CO., OHIO

DATE:
JULY 1998

PWMCOI



N

0 50 100
SCALE IN FEET

LEGEND

SB-10 SOIL SAMPLE LOCATION

FIGURE 2

Hull & Associates, Inc.
TOLEDO, OHIO

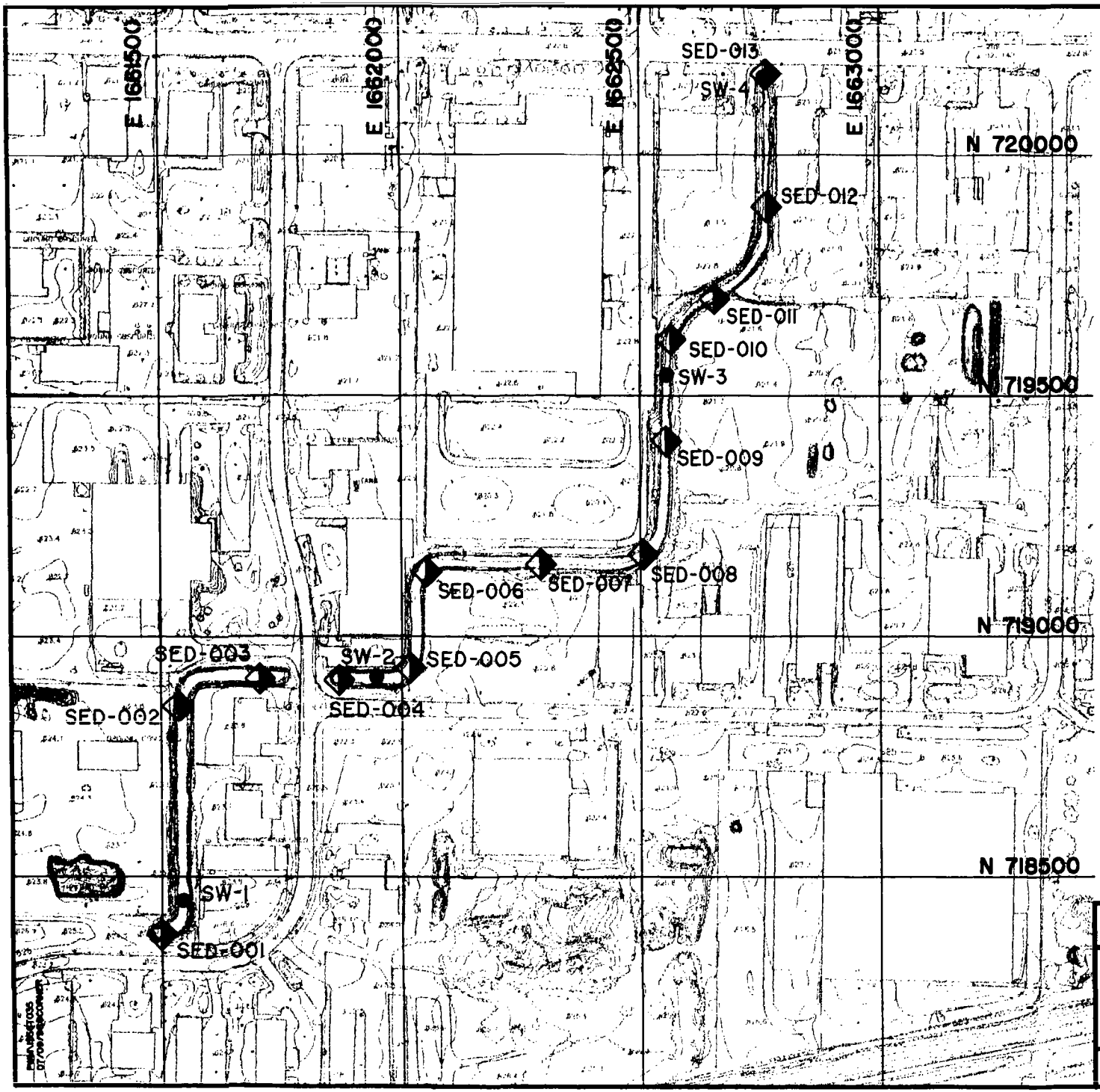
KERR-McGEE CHEMICAL, LLC.
TOLEDO TIE TREATMENT SITE
TIME CRITICAL REMOVAL PLAN

SOIL SAMPLING LOCATIONS

CITY OF TOLEDO, LUCAS CO., OHIO

DATE:
JULY 1998

PWM001



N

0 150 300
SCALE IN FEET

LEGEND

SED-010 ◆ SEDIMENT SAMPLE LOCATION

SW-3 ● SURFACE WATER LOCATION

FIGURE 3

Hull & Associates, Inc.
TOLEDO, OHIO

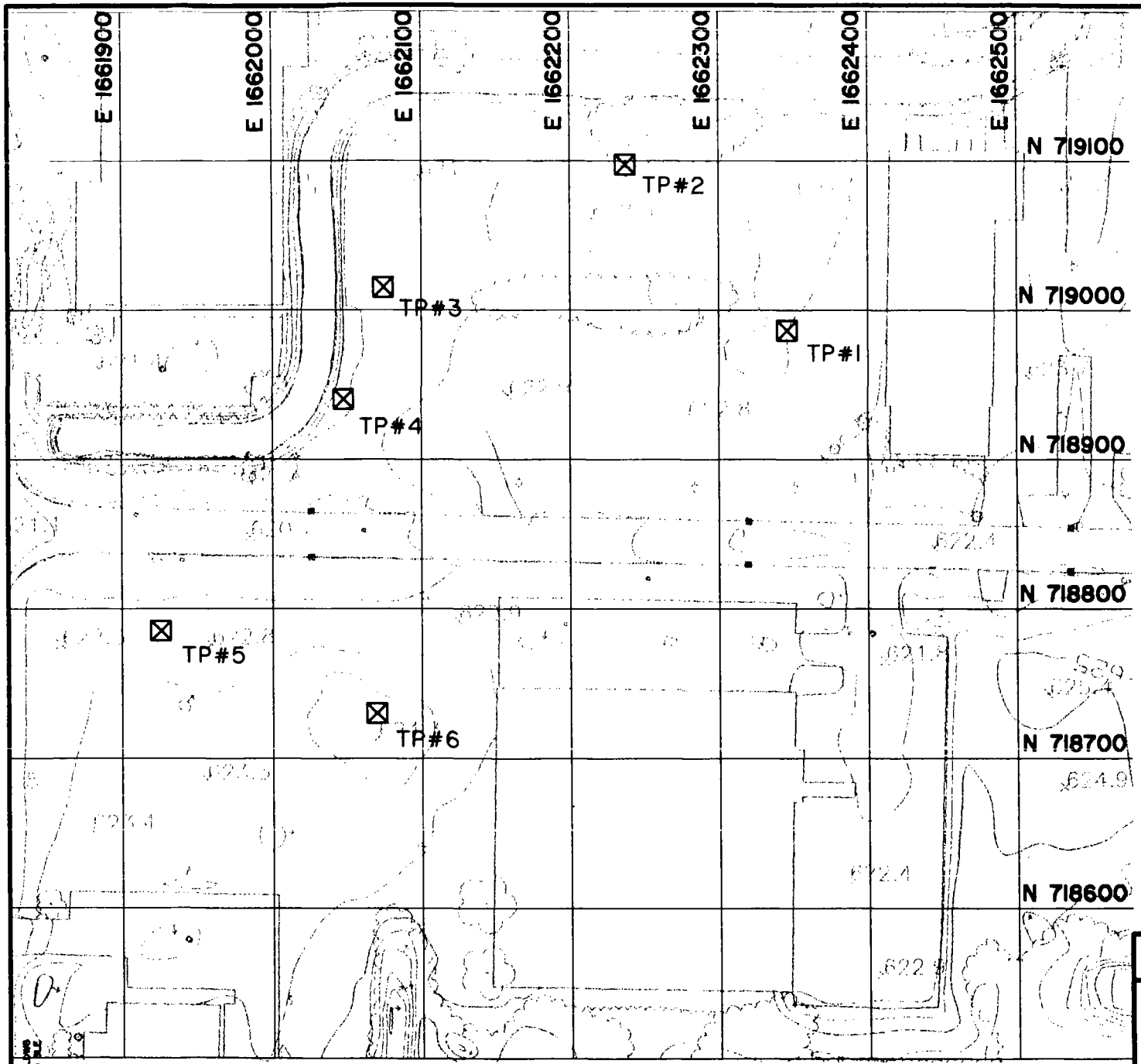
KERR-McGEE CHEMICAL, LLC.
TOLEDO TIE TREATMENT SITE
TIME CRITICAL REMOVAL PLAN

SEDIMENT AND SURFACE WATER SAMPLING LOCATIONS

CITY OF TOLEDO, LUCAS CO., OHIO

DATE:
JULY 1998

PWM001



N

0 50 100
SCALE IN FEET

LEGEND

TP#3 ⊠ TEST PIT LOCATION

FIGURE 4

Hull & Associates, Inc.
TOLEDO, OHIO

KERR-McGEE CHEMICAL, LLC.
TOLEDO TIE TREATMENT SITE
TIME CRITICAL REMOVAL PLAN

TEST PIT LOCATIONS

CITY OF TOLEDO, LUCAS CO., OHIO

DATE: JULY 1998

PWM001

TABLES

TABLE 1
SURFACE WATER SAMPLING NOTES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Sample Point	Sample Time	Temperature (degrees F)	pH (S.U)	Conductance (uohms/cm)	Notes
BG1	1120	68	7.1	894	Water sample collected from ditch at a location prior to where it enters the piped (underground) section of Williams Ditch. This locality is adjacent to cultivated land directly behind a machine shop.
SW1	1430	66.9	6.79	1352	Water sample collected at resurgence of Williams Ditch, adjacent to the concrete outfall, on the downstream side of the boom dam.
SW2	1330	68.7	7.83	1920	Water sample collected at resurgence of Williams Ditch, after flowing under Arco Drive, adjacent to the concrete outfall, on the downstream side of the boom dam. The water surface at this locality has areas of strong sheen. The field blank was taken following collection of this sample and decontamination of the sampler. Field blank sampling procedures consisted of pouring lab supplied water into the dipper and then transferring the water into the sample jars.
SW3	1230	65.5	7.69	1739	Water sample was collected approximately 100 feet downstream of the last siphon dam, on the downstream side of a boom dam. Water at this location is very shallow and the sample taken was very turbid due to disturbed bottom material.
SW4	1200	67.3	7.59	1766	Water sample was collected from the ditch directly upstream of the concrete pipe that carries Williams Ditch under Hill Avenue.

NOTES

Samples were taken as close as practical to the locations shown on Figure A1 contained in Appendix A of the Removal Action Work Plan.

Decontamination procedures for the "dipper" consisted of an initial alconox and potable water wash, followed by a DI water brush and rinse, and completed with a DI water spray rinse. Decontamination fluids were containerized and emptied into the waste water tank at the end of the sampling event.

TABLE 2
SUMMARY OF ANALYTICAL RESULTS
SURFACE WATER SAMPLES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Parameter	Analytical Results				
	SW-B1	SW-1	SW-2	SW-3	SW-4
VOLATILES (ug/l)					
Tetrachloroethene	<1	2J	1J	<1	<1
SEMI-VOLATILES (ug/l)					
Phenanthrene	<1	<0.9	18	2J	<0.9
Anthracene	<1	<0.9	1J	<0.9	<0.9
Fluoranthene	<1	<0.9	34	10	1J
Pyrene	<1	<0.9	24	8J	<0.9
Benzo(a)anthracene	<1	<0.9	5J	3J	<0.9
Bis(2-ethylhexyl)phthalate	<2	<0.9	<2	3J	<0.9
Chrysene	<1	<0.9	11	4J	<0.9
Benzo(b)fluoranthene	<1	<0.9	10	6J	<0.9
Benzo(k)fluoranthene	<1	<0.9	4J	2J	<0.9
Benzo(a)pyrene	<1	<0.9	5J	4J	<0.9
Indeno(1,2,3-cd)pyrene	<1	<0.9	4J	3J	<0.9
Benzo(ghi)perylene	<1	<0.9	3J	2J	<0.9
CHLORINATED HERBICIDES (ug/l)					
2,4,5-T	<0.0096	0.0236J	0.0381J	NA	NA
2,4,5-TP	<0.0096	<0.095	0.0182J	NA	NA
ORGANOCHLORINE PESTICIDES AND PCBs (ug/l)					
PCB-1260	<0.095	<0.095	0.316J	<0.095	<0.095
METALS (mg/l)					
Arsenic	<0.005	<0.005	<0.005	0.017	<0.005
Barium	0.0497J	0.0893J	0.0918J	0.32	0.0843J
Chromium	<0.0066	<0.0045	<0.0066	0.0283J	<0.0066
Copper	0.0047J	<0.0045	0.0054J	0.083	0.0052J
Lead	<0.021	<0.021	<0.021	0.093J	<0.021
Zinc	<0.009	0.0103J	0.0150J	0.537	0.0198J
Mercury	0.000099J	0.000096J	<0.000023	0.000163J	0.000088J

NA - Not Analyzed

J denotes that the concentration found is below the method detection limit and therefore can not be precisely quantified. The value indicated is a laboratory estimate.

Dinoseb was detected at concentration of 0.065J ug/l and Barium was detected at a concentration of 0.0061J mg/l in the equipment blank.

TABLE 3
SOIL SAMPLING NOTES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Boring Number	CPT Equivalent	Sample Number	Depth of Sample (feet bgs)	Time Sampled	Sample Description
SB-1	BG-1	PWM001-SB1-SS3-D385	9.0-11.0	900	Sample collected @ 9 to 11 feet bgs from a saturated, loose, Brn fine SAND containing shell fragments. This unit overlies a Dk gray lacustrine clay.
SB-2	CPT-27	PWM001-SB2-SS2-D385	2.0-3.5	935	Sample collected @ 2 to 3.5 feet bgs from a slightly cohesive, Brn fine clayey SAND. This unit overlies a Dk gray lacustrine clay that contains small fine sand lenses.
SB-3	CPT-39	PWM001-SB3-SS2-D385	3.5-5.5	1025	Sample collected @ 3.5 to 5.5 feet bgs from alternating seams of Dk gray loose silt & Dk gray lacustrine clay.
SB-4	CPT-57	PWM001-SB4-SS2-D385	4.0-6.0	1105	Sample collected @ 4 to 6 feet bgs from Blk stained fine to med. SAND (4-5.5 feet) and Dk gray SILT (5.5-6.0 feet). These units demonstrated strong sheen and possessed creosote type odor and overlie a Dk gray lacustrine clay.
SB-5	CPT-4	PWM001-SB5-SS2-D385	5.0-7.0	1148	Sample collected @ 5 to 7 feet bgs from a Dk gray to Blk stained fine silty SAND that possessed a strong creosote type odor and sheen. This unit overlies a Dk gray lacustrine clay. Silt seams within the upper part of the lacustrine unit show some sheening also.
SB-6	CPT-61	PWM001-SB6-SS1-D385	6.0-8.0	1408	Sample collected @ 6 to 7.5 feet bgs from a saturated, loose, Gray fine SAND that possesses a strong creosote type odor and sheen. This unit overlies a Dk gray lacustrine clay.
SB-7	CPT-56	PWM001-SB7-SS3-D385	7.0-9.5	1536	Sample collected @ 7 to 9.5 feet bgs from a saturated, loose, Gray fine SAND containing shell fragments and possessing a strong creosote type odor and sheen. This unit overlies a Dk gray lacustrine clay.
SB-8	CPT-48	PWM001-SB8-SS2-D385	4.0-6.5	1612	Sample collected @ 4 to 6.5 feet bgs from a Blk stained Gray fine to med SAND that demonstrates a strong sheen and possesses a creosote type odor. This sand unit overlies a Dk gray lacustrine clay which contains very thin sand seams.
SB-9	CPT-16	PWM001-SB9-SS2-D385	4.5-6.0	1651	Sample collected @ 4.5 to 6 feet bgs from a Dk gray to Blk stained fine SAND and a Gray lacustrine CLAY containing fine sand and silt seams. Both the fine sand and the silt and sand seams within the upper part of the lacustrine unit possess strong creosote type odor and sheen.
SB-10	CPT-58	PWM001-SB10-SS3-D385	4.0-6.0	1725	Sample collected @ 4 to 6 feet bgs from a Blk stained Gray fine SAND that demonstrates a strong sheen and possesses a creosote type odor. Sand is saturated with free product @ 6 feet. The unit overlies a Dk gray lacustrine clay

NOTES

This field blank was collected adjacent to SB-6 by passing laboratory supplied water through the decontaminated macro sampler.

TABLE 4
SUMMARY OF ANALYTICAL RESULTS
SOIL SAMPLES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Parameter	Analytical Results									
	SB1-SS3	SB2-SS2	SB3-SS2	SB4-SS2	SB5-SS2	SB6-SS-2	SB7-SS3	SB8-SS2	SB9-SS2	SB10-SS2
sample depth (feet bgs)	9-11	2.0-3.5	3.0-5.0	4.0-6.0	5.0-7.0	6.0-8.0	7.0-9.0	4.0-6.0	4.5-6.5	4.0-6.0
CPT number	BG-1	CPT-27	CPT-39	CPT-57	CPT-4	CPT-61	CPT-56	CPT-48	CPT-16	CPT-58
VOLATILES (mg/kg wet weight as received)										
Acetone	<0.007	<0.006	<0.006	<3.2	<3.1	0.007J	<3.3	<32	<3.4	<6.5
Benzene	<0.001	<0.0009	<0.0009	7.4	1.4J	0.072	26	12	9.4	8.9
Toluene	<0.001	<0.0009	<0.0009	7.3	1.4J	0.035	110	28	16	35
Ethylbenzene	<0.001	<0.0009	<0.0009	24	4.6	0.45	100	32	9.5	21
Xylene (total)	<0.001	<0.0009	<0.0009	48	9	0.3	210	76	38	66
Styrene	<0.001	<0.0009	<0.0009	<0.45	<0.45	<0.001	<0.47	<4.6	5.4	6
SEMI-VOLATILES (mg/kg dry weight)										
2-picoline	<0.082	<0.79	<0.085	2.9J	<0.86	<0.081	<2	<2	2.2J	<2
Phenol	<0.082	<0.79	<0.085	<1.6	<0.86	<0.081	<2	<2	26	<2
2-methyphenol	<0.041	<0.4	<0.043	<0.67	<0.43	<0.04	<1	<1	19	<1
3- and 4- methylphenol	<0.082	<0.79	<0.085	4.3J	2.4J	<0.081	<2	<2	53	<2
2,4-dimethylphenol	<0.082	<0.79	<0.085	4.4J	<0.86	<0.081	4.6J	4.1	39	23
Naphthalene	<0.041	0.48J	<0.043	990	140	47	2800	1600	2200	4900
2-methylnaphthalene	<0.041	<0.4	<0.043	230	43	20	680	500	1	810J
Acenaphthylene	<0.041	18	<0.043	29	5.1	870	79	58	110	120
Acenaphthene	<0.041	1.3J	<0.043	260	38	12	400	400	230J	640J
Dibenzofuran	<0.041	.65J	<0.043	200	34	11	350	340	260J	550J
Fluorene	<0.041	2J	<0.043	250	44	14	410	420	310J	440J
Phenanthrene	<0.041	8.8	<0.043	640	100	27	1000	990	850	1800J
Anthracene	<0.041	19	<0.043	76	28	4.1	240	100	470	290J
Fluoranthene	<0.041	97	<0.043	350	57	11	470	490	440	940J
Pyrene	<0.041	95	<0.043	260	48	8.7	370	390	330J	720J
Benzo(a)anthracene	<0.041	66	<0.043	89	19	2.6	120	130	140J	260J
Bis(2-ethylhexyl)phthalate	<0.082	<0.79	<0.085	<1.6	<0.86	0.1J	<2	<2	<2.1	<2
Chrysene	<0.041	60	<0.043	74	18	2.4	120	110	120J	<2
Benzo(b)fluoranthene	<0.041	87	<0.043	68	17	2.1	98	93	120	<1
Benzo(k)fluoranthene	<0.041	30	<0.043	22	5.9	0.72	40	34	42	62
Benzo(a)pyrene	<0.041	67	<0.043	54	13	1.7	80	76	95	150
Indeno(1,2,3-cd)pyrene	<0.041	46	<0.043	25	6.7	0.95	40	38	52	79
dibenz(a,h)anthracene	<0.041	12	<0.043	6.5	1.9J	0.27J	11	11	14	20
benzo(ghi)perylene	<0.041	36	<0.043	21	5.3	0.79	33	32	40	63
ORGANOCHLORINE PESTICIDES AND PCBs (mg/kg dry weight)										
Aldrin	<0.000083	<0.0016	<0.000086	<0.0016	<0.0017	0.0055J	<0.0016	<0.0016	<0.0017	<0.0016
Beta BHC	<0.000083	0.006J	<0.000086	<0.0016	<0.0017	<0.0016	<0.0016	<0.0016	<0.0017	<0.0016
Delta BHC	<0.000083	0.0056J	<0.000086	0.0032J	0.0055J	0.0027J	0.0027J	0.0023J	0.0067J	<0.0016
DDT	<0.00016	0.032	<0.00017	0.061	0.037	<0.0016	<0.0031	<0.0032	0.056	0.144
DDE	<0.00016	<0.0031	<0.00017	<0.0031	0.0129J	<0.0031	<0.0031	<0.0032	<0.0032	<0.0031
Endosulfan I	<0.00016	<0.0016	<0.00017	<0.0016	<0.0017	<0.0016	0.0116	<0.0016	0.0096	0.0155
Endosulfan II	<0.000083	0.0042J	<0.00017	0.0051J	<0.0033	<0.0031	0.0124J	0.0043J	<0.0032	0.0076J
Endosulfan Sulfate	<0.00016	0.083	<0.00017	0.074	0.047	0.0076J	0.297	0.128	0.265	0.193
Endrin	<0.00016	0.02	<0.00017	0.0041J	0.0064J	<0.0031	0.0079J	0.0047J	0.0095J	0.0154
Endrin Aldehyde	<0.00016	0.02	<0.00017	<0.0031	<0.0033	<0.0031	<0.0031	<0.0031	<0.0032	<0.0031
Heptachlor	<0.000083	0.0037J	<0.000086	<0.0016	<0.0017	<0.0016	0.03	0.0074J	0.0261	0.0236
Heptachlor epoxide	<0.000083	<0.0016	<0.000086	<0.0016	<0.0017	<0.0016	<0.0016	0.0027J	<0.0017	<0.0016
Kepone	<0.00083	<0.016	<0.00086	<0.016	<0.017	<0.016	<0.016	0.04J	<0.017	0.144
Methoxychlor	<0.00083	<0.016	<0.00086	0.093	0.075J	<0.016	0.339	0.239	0.35	0.679
METALS (mg/kg dry weight)										
Mercury	0.0047J	0.0375J	0.0219J	0.0072J	0.0734J	0.0085J	0.0060J	0.011J	0.25	0.0253J
Barium	10.2J	48	81	14	46	9.86J	11.5J	18	62	22
Cadmium	0.24J	0.51J	1.04J	<0.23	0.64J	<0.23	<0.023	0.31J	0.88J	<0.23
Copper	5.4	11	22.6	5.3	32.2	3.8J	6.5	7	16.5	9
Chromium	4.12J	12	16.6	5.5	9.9	4.01	5.1	7.1	13.5	4.3J
Lead	<3.2	11.2J	11.2J	<3.1	53	<3.1	3.4J	4J	31	<3.1
Zinc	20	38	54	15	57	15	15	19	105	14
Arsenic	4.2	4.7	12.6	3.5	6.9	2.4	3.6	4.4	10.8	1.3
Selenium	<0.46	<0.44	<0.47	<0.44	<0.47	<0.45	<0.45	<0.45	<0.46	0.58J

TABLE 5
TEST PIT EXCAVATION NOTES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Test Pit Number	Adjacent to CPT Boring	Total Depth (ft. bgs)	Depth Contaminant Encountered (ft. bgs) (1)	Notes
TP#1	CPT#40	7.6	None Observed	No staining observed or odor detected. Very little water entering the excavation. Digging terminated in gray lacustrine clay deposits.
TP#2	CPT#38	9.6	None Observed	No staining observed or odor detected. First water encountered at approximately 4 ft. bgs along an interface between two lacustrine clay deposits. A greater quantity of water encountered in a sand (?) seam at approximately 8 ft. bgs. Digging terminated in gray lacustrine clay deposits.
TP#3	CPT#35	6	None Observed	No staining observed or odor detected. First water encountered at approximately 4 ft. bgs in an approximately 6 inch thick brown fine sand seam which overlies a mottled brown/gray lacustrine clay deposit below the stained sand. Digging terminated in gray lacustrine clay deposits.
TP#4	CPT#33	5.3	2.5 to 3	Staining observed in a sand rich seam at approximately 2.5 ft. bgs. Boring terminated in lacustrine clay deposit below the stained sand.
TP#5	CPT#48	7.5	4 to 6	Water and dark colored liquid (w/strong peacock sheen) observed in a 6 inch sand seam at approximately 4 ft. bgs. Additional staining observed to approximately 6 ft. bgs. Excavation terminated in gray lacustrine clay encountered @ appoximately 6.5 ft. bgs.
TP#6	CPT#56	7.5	7	Water encountered at approximately 4 ft. bgs in a gray fine sand. Strong staining and dark colored liquids displaying a strong peacock sheen were encountered at approximately 7 ft. bgs in zones where the sand coarsened. The boring was terminated at this point due to the quantity of water entering the excavation and the amount of contaminants observed.

NOTES

bgs Below ground surface
(1) Based on olfactory and visual observations

TABLE 6
SEDIMENT SAMPLING NOTES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Sediment Sample Number	Depth of Sample (feet bgs)	Date Sampled	Time Sampled	Sample Description
SED-BG	0-1.2	5/15/98	1355	Drove sampler and recovered 1.2 feet
SED-001	1.5-2.0	5/15/98	1015	Drove sampler and recovered approximately 2.5 feet. Sed Profile: 0 to 1.5 organic material; 1.5 to 2.0 silt, 2 0 to 2.5 clay/silt. No flourescence detected.
SED-002	1-1.5	5/15/98	852	Drove sampler and recovered approximately 2.5 feet. Sed Profile: 0 to 1 organic material; 1.0 to 1.5 sand and silt; 1.5 to 2.5 clay/silt. No flourescence detected.
SED-003	1-1.75	5/15/98	730	Drove sampler and recovered approximately 2.0 feet. Sed Profile: organic rich zone followed by sand followed by clay. Sand zone sampled. No flourescence detected.
SED-004	0-1.2	5/14/98	1835	Drove sampler and recovered 1.2 feet. Sed Profile: 1.2 feet of silt containing free product with clay in the very tip of the sampler.
SED-005	0-1.8	5/14/98	1300	Entire sample consisted of fine sand and silt held in suspension by Free Product.
SED-006	0.5-1	5/14/98	930	Base of ditch contained large gravel that required several attempts to bypass. Sed. Sample recovery approximately 1.2 ft. Sed Profile: 0 to 0.75 ft dark black organic rich loose sand and silt possessing a strong odor and sheen; 0.75 to 1.0 ft silt with strong odor and sheen (0 to 1 ft strong flourescence); 1 to 1.2 very soft gray silt and clay.
SED-007	2.5-3.5	5/14/98	825	Drove sampler approximately 3.8 feet - 3.6 feet recovered. Sed Profile: 0 to 1.5 very loose black silt and fine sand possessing a strong sheen and odor; 1.5 to 3.6 very soft gray silt and clay (strong flourescence).
SED-008	1.75-3.0	5/13/98	1820	Drove sampler approximately 4.0 feet - 3.3 feet recovered. Sed Profile: 0 to 2.5 ft dark black organic rich silt with some sand, strong sheen and some odor; 2.5 to 3.0 ft dark gray fine sand (strong flourescence); 3.0 to 3.3 ft clay.
SED-009	2.5-3.1	5/13/98	1602	Drove sampler approximately 3.9 feet - 3.5 feet recovered. Sed Profile: 0 to 2.8 ft organic rich material; 2.8 to 3.0 ft dark gray fine sand (strong flourescence); 3.0 to 3.3 ft clay.
SED-010	1.1-1.6	5/13/98	1215	Drove sampler approximately 3.5 feet - 2.1 feet recovered. Sed Profile: 0 to 1.6 ft organic rich silt; 1.6 to 2.1 ft fine sand with little silt. No flourescence detected.
SED-011	1.3-2.6	5/13/98	950	Drove sampler approximately 3.6 feet - 2.7 feet recovered. Sed Profile: 0 to 1.3 ft organic rich silt; 1.3 to 2.6 ft fine sand with little silt containing a thin organic rich seam @ 1.6 ft.; 2.6 to 2.7 ft soft dark gray clay with black staining. No flourescence detected.
SED-012	0.8-1.6	5/13/98	830	Drove sampler approximately 3.5 feet - 1.7 feet recovered. Sed Profile: 0 to 0.6 ft organic rich silt; 0.6 to 1.5 ft laminated silt and sand; 1.5 to 1.7 ft soft gray clay. Sample collected from the laminated fine sand and silt based on flourescence.
SED-013	0.9-1.2	5/12/98	1705	Drove sampler approximately 3.8 feet - 2.8 feet recovered. Sample collected from a gray clayey sand seam dividing a dark black organic rich seam. (FID response: 61.9 ppm - no response in adjacent sediments)

NOTES

The field blank was collected adjacent to SED-004 by passing laboratory supplied water through the decontaminated sediment sampler.

TABLE 7
SUMMARY OF ANALYTICAL RESULTS
SEDIMENT SAMPLES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Parameter	Analytical Results (mg/kg)													
	SED-BG	SED-001	SED-002	SED-003	SED-004	SED-005	SED-006	SED-007	SED-008	SED-009	SED-010	SED-011	SED-012	SED-013
VOLATILES														
Xylene	<0.001	<0.002	<0.002	0.007J	150	910	29	3.1	3.1	0.010J	0.016	<0.002	<0.002	0.036J
Acetone	<0.009	0.021J	<0.011	0.033J	<27	<15	<5.7	<1.4	<1.8	0.045J	0.039J	<0.011	0.013J	<0.077
Ethylbenzene	<0.001	<0.002	<0.002	<0.002	76	410	11	1.7	1.8	<0.003	<0.002	<0.002	<0.002	<0.011
Toluene	<0.001	<0.002	<0.002	<0.002	<3.8	360	1.4J	<0.19	<0.26	<0.003	<0.002	<0.002	<0.002	<0.011
Benzene	<0.001	<0.002	<0.002	<0.002	<3.8	77	<0.82	<0.19	<0.26	<0.003	<0.002	<0.002	<0.002	<0.011
Vinyl acetate	<0.004	<0.006	<0.005	<0.007	40	<6.6	<2.5	<0.58	<0.77	<0.008	<0.006	<0.005	<0.005	<0.033
SEMI-VOLATILES														
3- and 4-methylphenol	<0.089	<0.14	<0.11	<0.14	<5.1	78J	<0.87	<1	<1.4	<1.7	<0.67	<0.1	<0.52	<2.9
Acetophenone	<0.044	<0.071	<0.053	<0.071	<2.5	15J	<0.44	<0.52	<0.68	<0.87	<0.34	<0.05	<0.26	<1.5
2,4-dimethylphenol	<0.089	<0.14	<0.11	<0.14	<5.1	95J	<0.87	<1	<1.4	<1.7	<0.67	<0.1	<0.52	<2.9
Naphthalene	<0.044	0.100J	0.096J	0.080J	1900	45000	800	220	820	<0.87	0.390J	0.080J	<0.26	<1.5
2-methylnaphthalene	<0.044	0.081J	0.085J	0.1	900	11000	230	52	290	0.980J	<0.34	<0.05	<0.26	<1.5
Acenaphthylene	<0.044	0.120J	0.320J	0.24J	38	850	9.4	2.9J	16	17	2.6J	0.73	2J	13J
Acenaphthene	<0.044	0.290J	0.470J	0.400J	680	8800	200	53	310	28	1.8J	0.99	2.9	28
Dibenzofuran	<0.044	0.210J	0.490J	0.330J	570	7000	150	45	240	22	1.2J	1.1	2.2J	25
Fluorene	<0.044	0.440J	1.1	0.680J	800	8900	200	70	340	52	2.3J	2.6	5.1	57
N-nitrosodiphenylamine	<0.044	0.330J	0.330J	0.400J	<2.5	<15	<0.44	<0.52	<0.68	<0.87	<0.34	<0.05	<0.26	<1.5
Phenanthrene	0.150J	3.8	5.4	4	1800	21000	460	150	860	320	9.8	9.9	25	230
Anthracene	<0.044	0.85	0.86	0.59J	220	3100	47	19	79	38	3.7	2	4.9	38
Fluoranthene	0.260J	6.7	8.3	6.2	1000	11000	250	78	570	460	33	14	61	350
Pyrene	0.240J	6.6	6.7	5.8	750	8200	190	51	430	360	28	11	46J	260
Butyl benzyl phthalate	<0.089	2.3	0.180J	0.420J	<5.1	<29	<0.87	<1	<1.4	<1.7	<0.67	<0.1	<0.58	<2.9
Benzo(a)anthracene	0.110J	2.7	2.2	1.9	250	2700	64	20	150	130	13	3.9	15	95
Bis(2-ethylhexyl) phthalate	0.110J	2.2	0.76	1.4	5.3	<29	<0.870	<1	1.4J	2.3J	1.7J	0.440J	0.640J	<2.9
Chrysene	0.140J	3.7	2.4	2.8	210	2200	43	16	130J	130	16	4.2	15	93
Di-n-octyl phthalate	<0.089	0.16	<0.11	<0.14	<5.1	<29	<0.87	<1	<1.4	<1.7	<0.67	<0.1	<0.52	<2.9
Benzo(b)fluoranthene	0.190J	4.4	2.4	3.5	190	1700	40	15	130J	130	17	4.7	14	88
Benzo(k)fluoranthene	0.071J	1.5	0.84	1.1	66	610	13	4.5J	35	41	6.2	1.7	4.7	32
Benzo(a)pyrene	0.130J	3	1.5	2.1	150	1400	32	11	71	75	11	3	9.6	59
Indeno(1,2,3-cd)pyrene	0.110J	2.7	1.1	1.9	80	690	16	5.6	38	44	7.5	2.1	5.5	33
Dibenz(a,h)anthracene	<0.044	0.55J	0.280J	0.430J	22	180	4.1J	1.6J	10	11	2J	0.54	1.5J	9.1J
Benzo(ghi)perylene	0.099J	2.3	0.91	1.7	65	570	13	4.4J	31	36	6.2	1.7	4.4	26

Concentrations of all chemicals were non-detect in equipment and trip blanks submitted with these samples.

TABLE 7 (cont.)
SUMMARY OF ANALYTICAL RESULTS
SEDIMENT SAMPLES
KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE

Parameter	Analytical Results (mg/kg dry weight)													
	SED-BG	SED-001	SED-002	SED-003	SED-004	SED-005	SED-006	SED-007	SED-008	SED-009	SED-010	SED-011	SED-012	SED-013
CHLORINATED HERBICIDES														
Dinoseb	<0.0023	0.199J	<0.0027	0.086J	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP (Silvex)	<0.00044	0.146	<0.00053	<0.014	0.045J	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-T	<0.00044	0.071J	0.0028	0.098	0.093J	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORGANOCHLORINE PESTICIDES AND PCBs														
Aldrin	<0.00089	<0.0029	<0.0021	<0.0029	<0.041	<0.024	<0.018	0.005J	<0.0028	<0.0035	<0.0027	<0.002	<0.0021	<0.0029
Alpha BHC	<0.00089	<0.0029	<0.0021	<0.0029	<0.041	<0.024	<0.018	<0.0021	0.0087J	<0.0035	<0.0027	<0.002	<0.0021	0.0054J
Delta BHC	<0.00089	<0.0029	<0.0021	<0.0029	0.075J	0.057J	0.042J	0.0063J	0.0121J	<0..0035	<0.0027	<0.002	<0.0021	0.0116J
Chlordane	0.170J	<0.14	<0.11	<0.14	<2.0	<1.2	<0.86	<0.1	<0.140	<0.17	<0.13	<0.099	<0.1	<0.14
DDT	0.0758	0.22	0.037	0.099	<0.079	0.79	0.042J	0.0126J	0.112	0.126	0.089	0.0185J	0.0195J	0.101
DDE	0.271	1	0.216	0.584	0.344J	0.33	<0.034	0.0053J	0.207	0.262	0.333	0.045	0.025	0.163
DDD	0.246	1.03	0.214	0.452	0.222J	<0.046	<0.034	0.0094J	0.147	0.245	0.3	0.029	0.033	0.347
Dieldrin	0.0064J	0.08	<0.0041	<0.0057	<0.079	<0.046	<0.034	0.0094J	<0.0053	0.0078J	0.0055J	0.0082J	<0.0041	<0.0057
Endosulfan II	<0.00089	<0.0056	<0.0041	<0.0057	<0.079	0.091J	<0.034	<0.004	0.0074J	<0.0068	<0.0053	<0.0039	<0.0041	0.0059J
Endosulfan Sulfate	<0.0017	<0.0056	0.015J	<0.0057	0.5	2.84	0.28	0.038	0.153	0.071	0.0137J	<0.0039	0.0146J	0.115
Endrin	<0.0017	<0.0056	<0.0041	<0.0057	<0.079	0.124J	<0.034	<0.004	<0.0053	<0.0068	<0.0053	<0.0039	<0.0041	0.0141
Endrin Aldehyde	<0.0017	<0.0056	<0.0041	<0.0057	0.296J	<0.046	<0.034	<0.004	<0.0053	<0.0068	<0.0053	<0.0039	<0.0041	<0.0037
Methoxychlor	<0.0089	<0.029	<0.021	<0.140	<2.0	3.8	<0.180	<0.021	0.31	0.21	<0.027	<0.020	<0.021	0.19
Mercury	0.0653J	0.0931J	0.0244J	0.125J	0.127J	0.0664J	0.0155J	0.0536J	0.0836J	0.113J	0.094J	0.0441J	0.0347J	0.0983J
Barium	26	126	67	127	160	54	44	78	124	140	91	44	44	79
Cadmium	<0.25	2.89J	1.15	2.91J	3.41J	0.93J	<0.25	0.46J	1.49J	3.53J	3.2J	0.65J	0.86J	2.09J
Chromium	5.9	26.6	14.2	28.6	32	10.5	12.6	17.4	23.2	35	24.4	13.1	11	26.8
Copper	7.8	60.6	21.6	49.6	66	18.1	11.1	22.9	35.3	50	41.3	16.4	16.4	36.3
Silver	<0.59	<0.94	<0.70	<1	<1.3	<0.77	<0.58	<0.68	<0.90	<1.2	<0.89	<0.66	<0.69	1.9
Zinc	34	297	112	264	406	102	39	65	210	405	272	89	83	207
Lead	11.1	162	65	133	165	50	10.7	16	125	202	117	52	69	183
Arsenic	1.9	13.2	6.8	13.2	15.8	10.7	4.8	7.5	15.1	22.1	15.2	7.6	7.7	14
Selenium	<0.49	<0.79	<0.59	<0.80	<1.1	1.64J	<0.48	<0.57	<0.76	<1	<0.75	<0.56	<0.58	<0.81

NA - Not Analyzed

Concentrations of all chemicals were non-detect in equipment and trip blanks submitted with these samples.

J denotes that the concentration found is below the method detection limit and therefore can not be precisely quantified. The value indicated is a laboratory estimate.

APPENDIX A

Overall Site Map

SDMS US EPA Region V

Imagery Insert Form

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APPENDIX A: OVERALL SITE MAP

☐ **Other:**

APPENDIX B

ROST™ Logs And LIF Signature Thickness Map

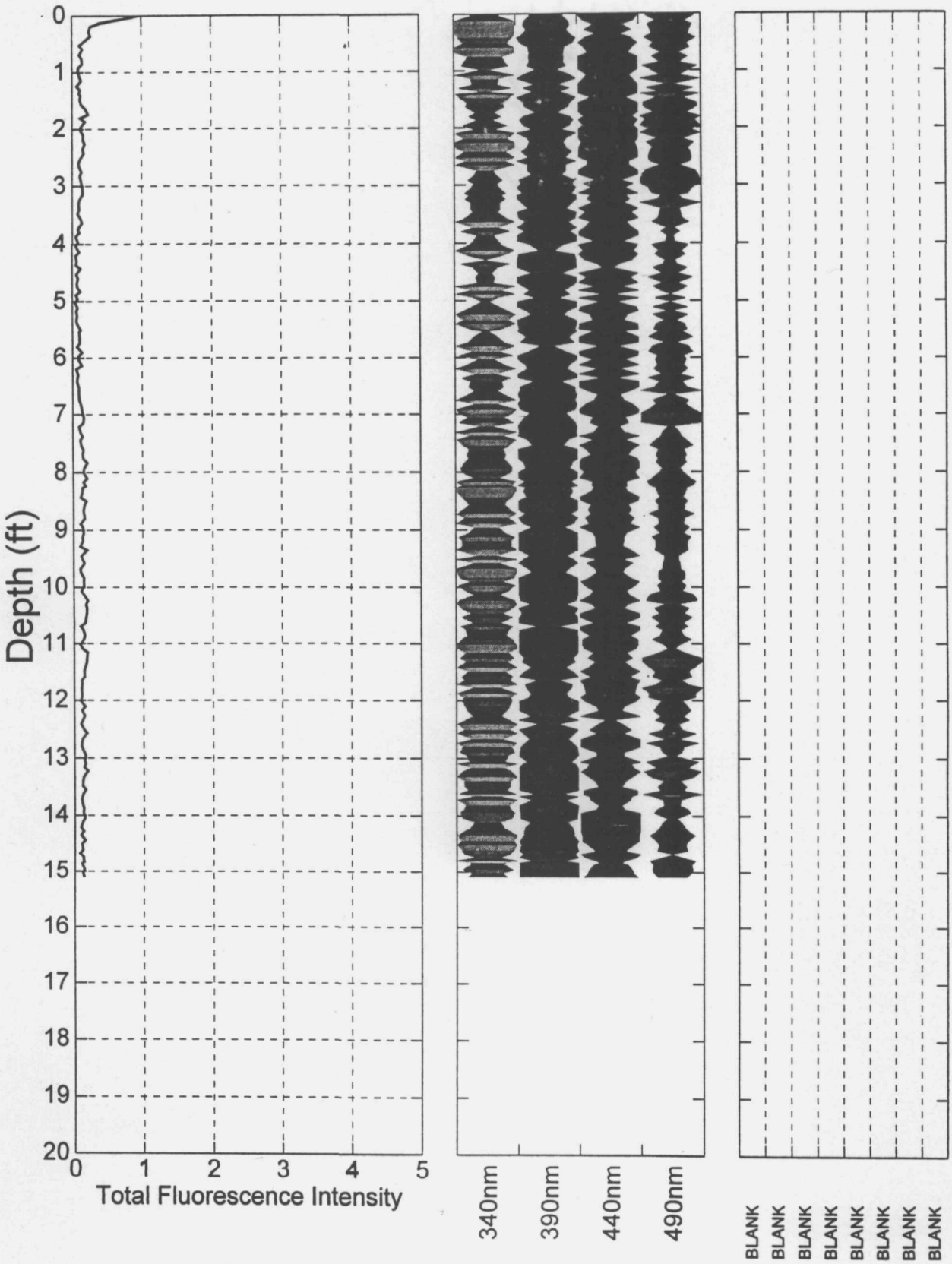
ROST™ LOGS

Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
0.8542%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT01

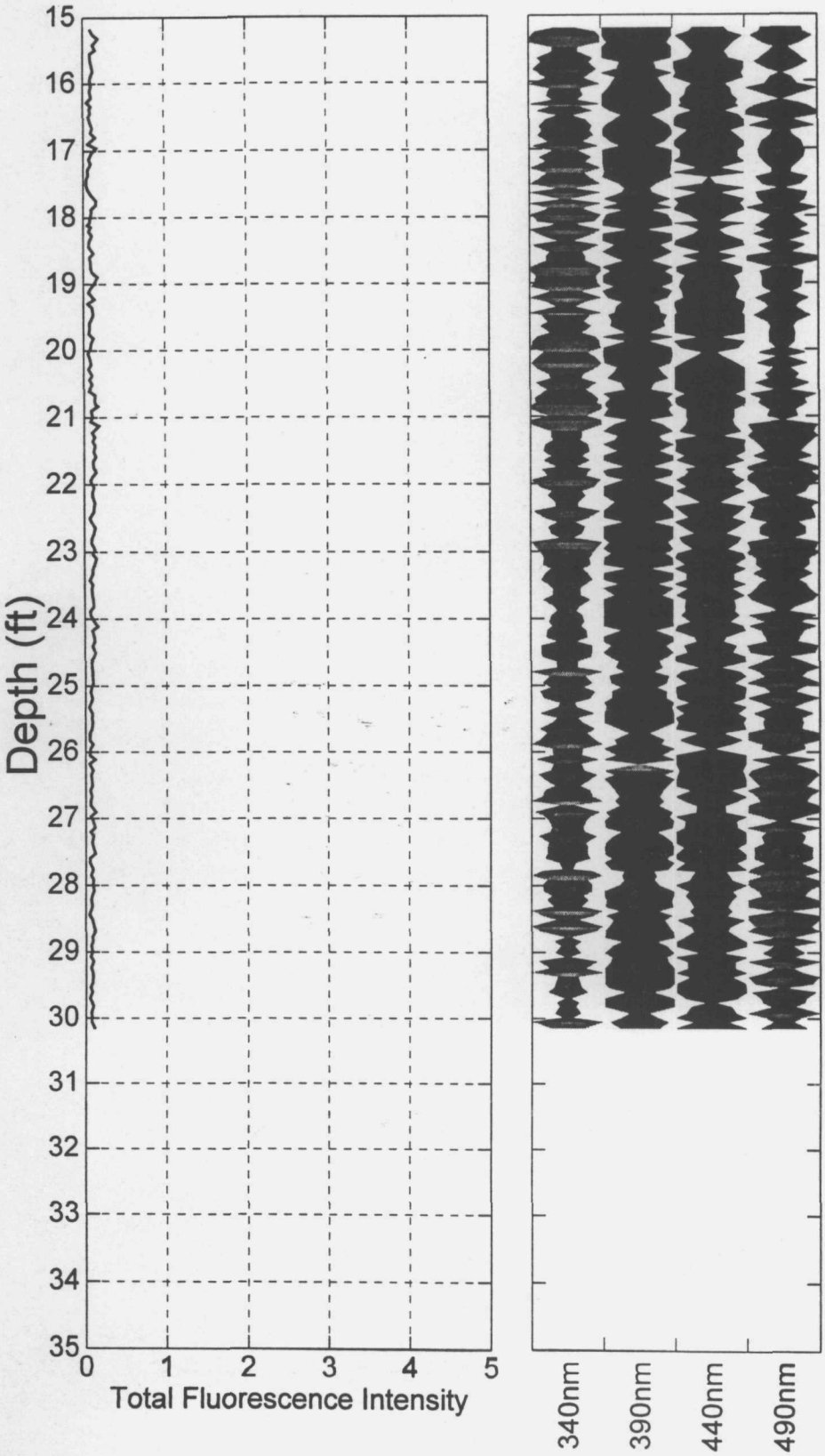


Measured LIF End Depth
30.15 ft
Measured Peak Fluorescence
0.1878%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT01A

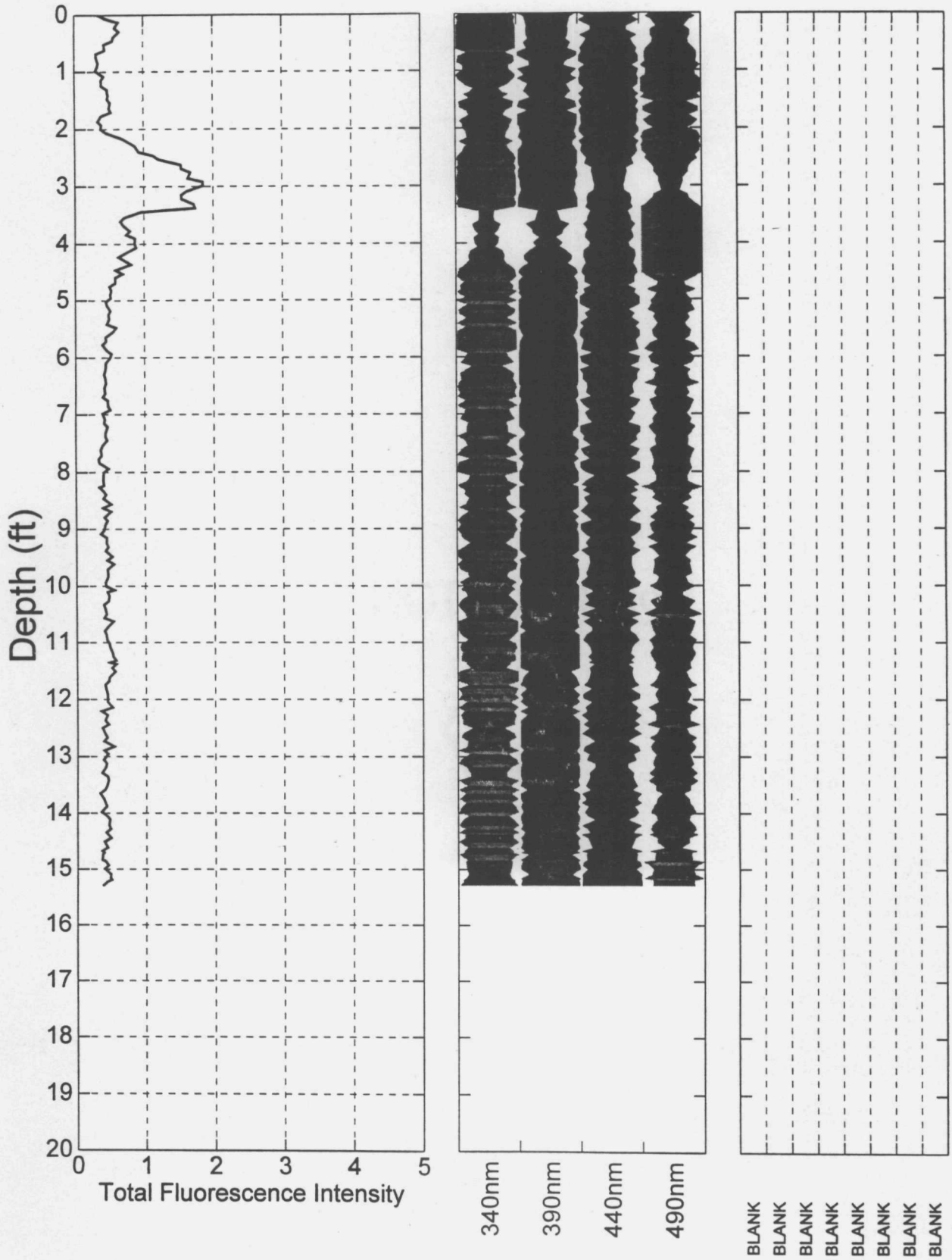


Measured LIF End Depth
15.29 ft
Measured Peak Fluorescence
1.853%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT02

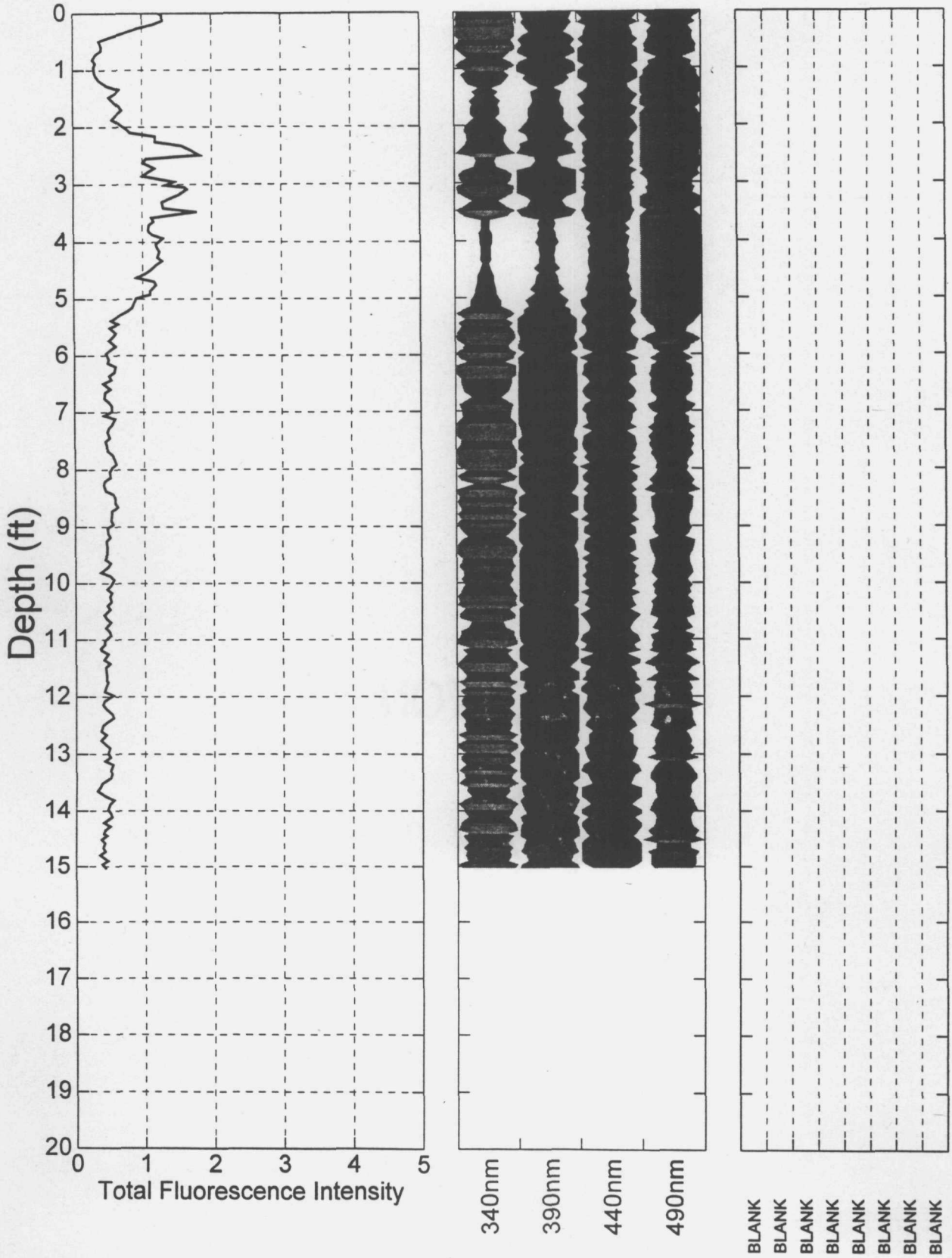


Measured LIF End Depth
15.03 ft
Measured Peak Fluorescence
1.821%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT03

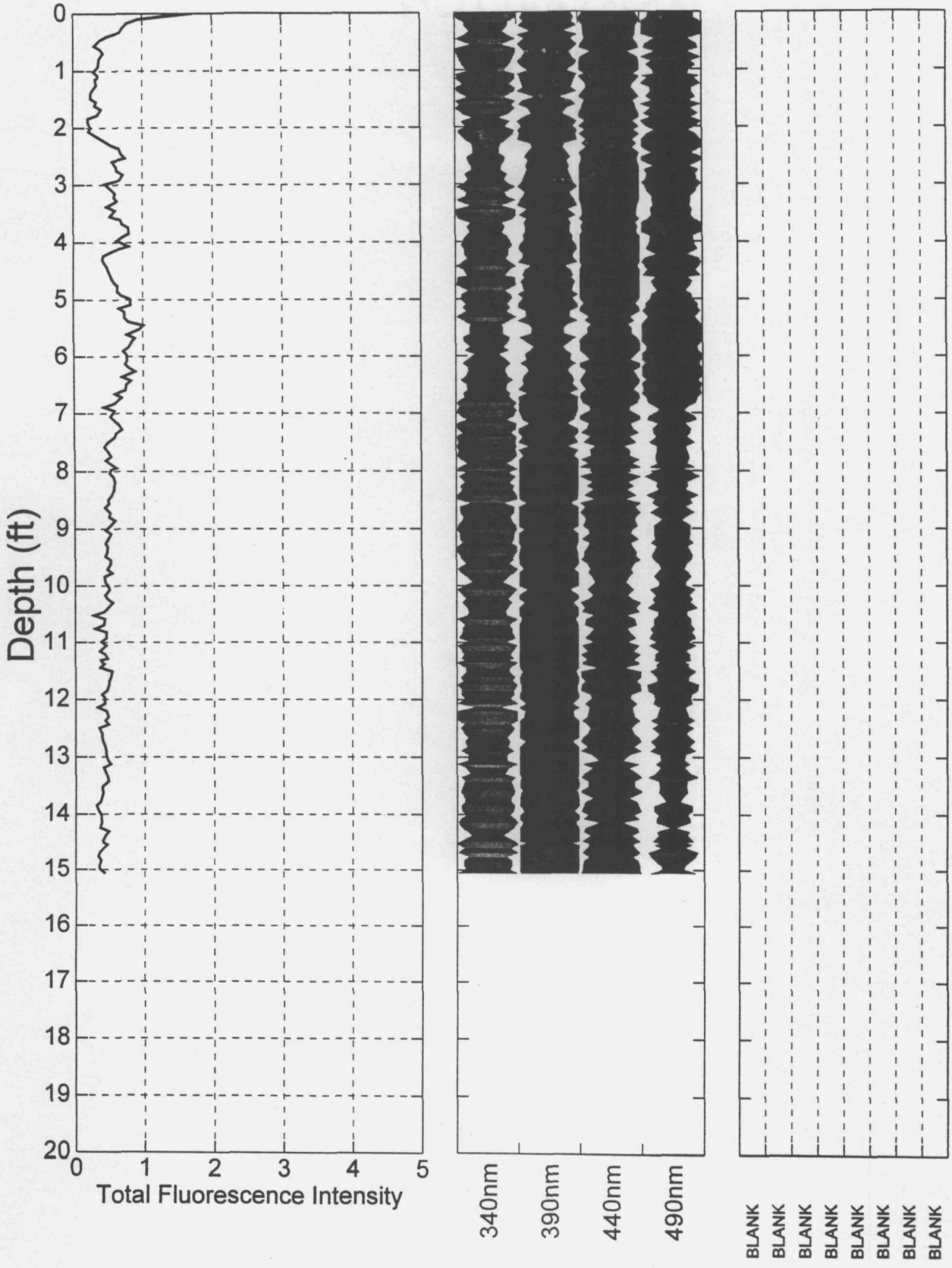


Measured LIF End Depth
15.06 ft
Measured Peak Fluorescence
1.007%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT04

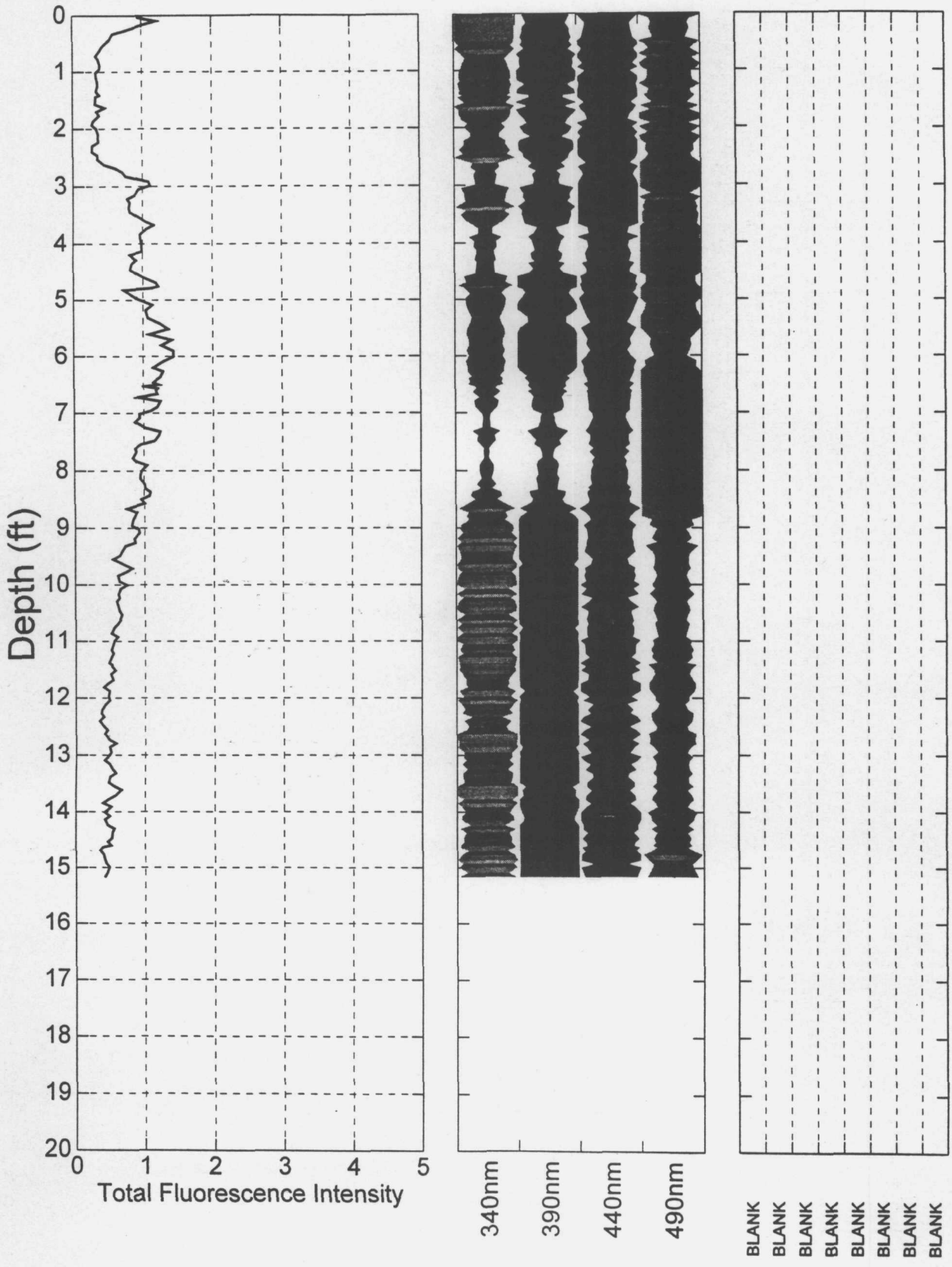


Measured LIF End Depth
15.16 ft
Measured Peak Fluorescence
1.429%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT05

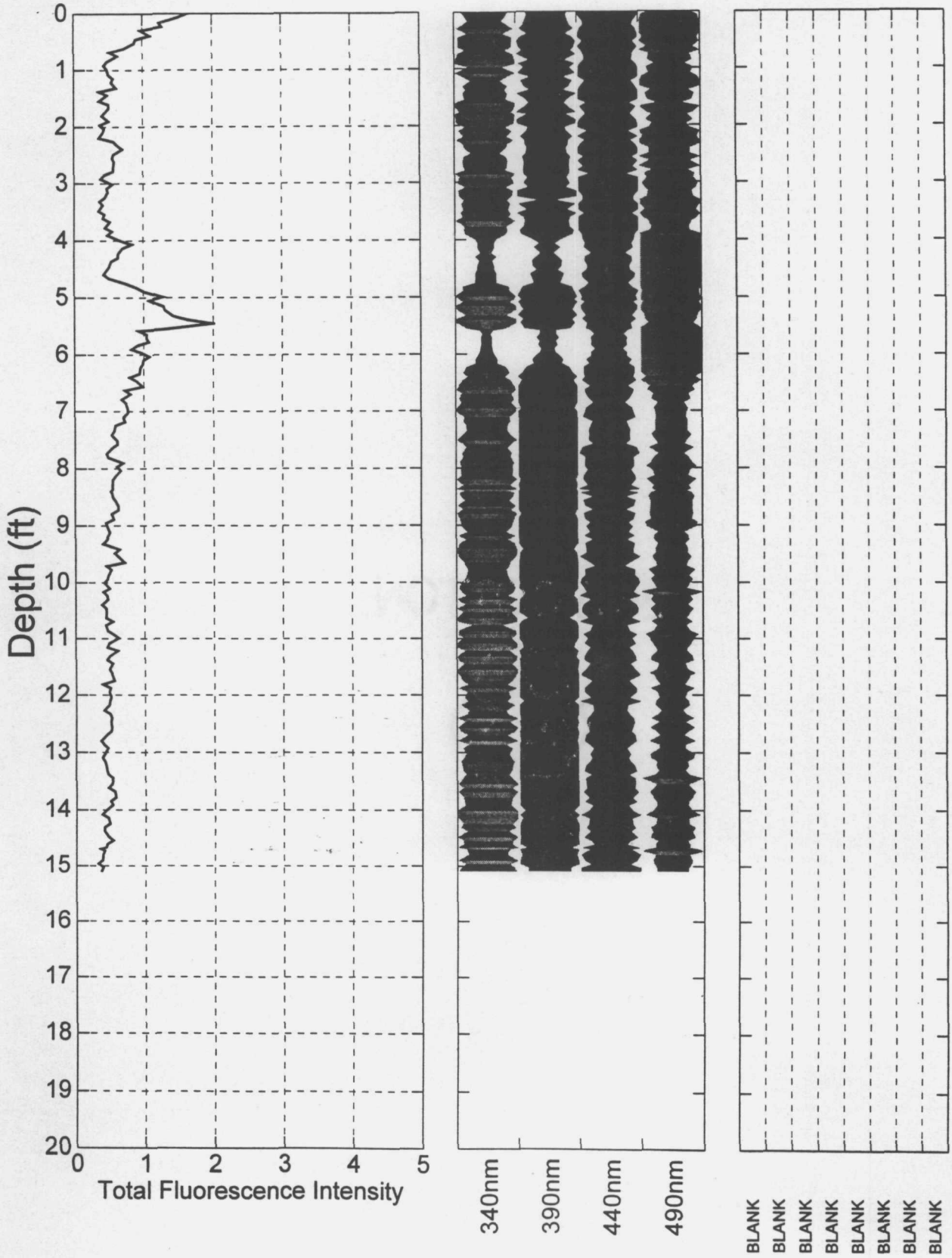


Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
1.985%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT06

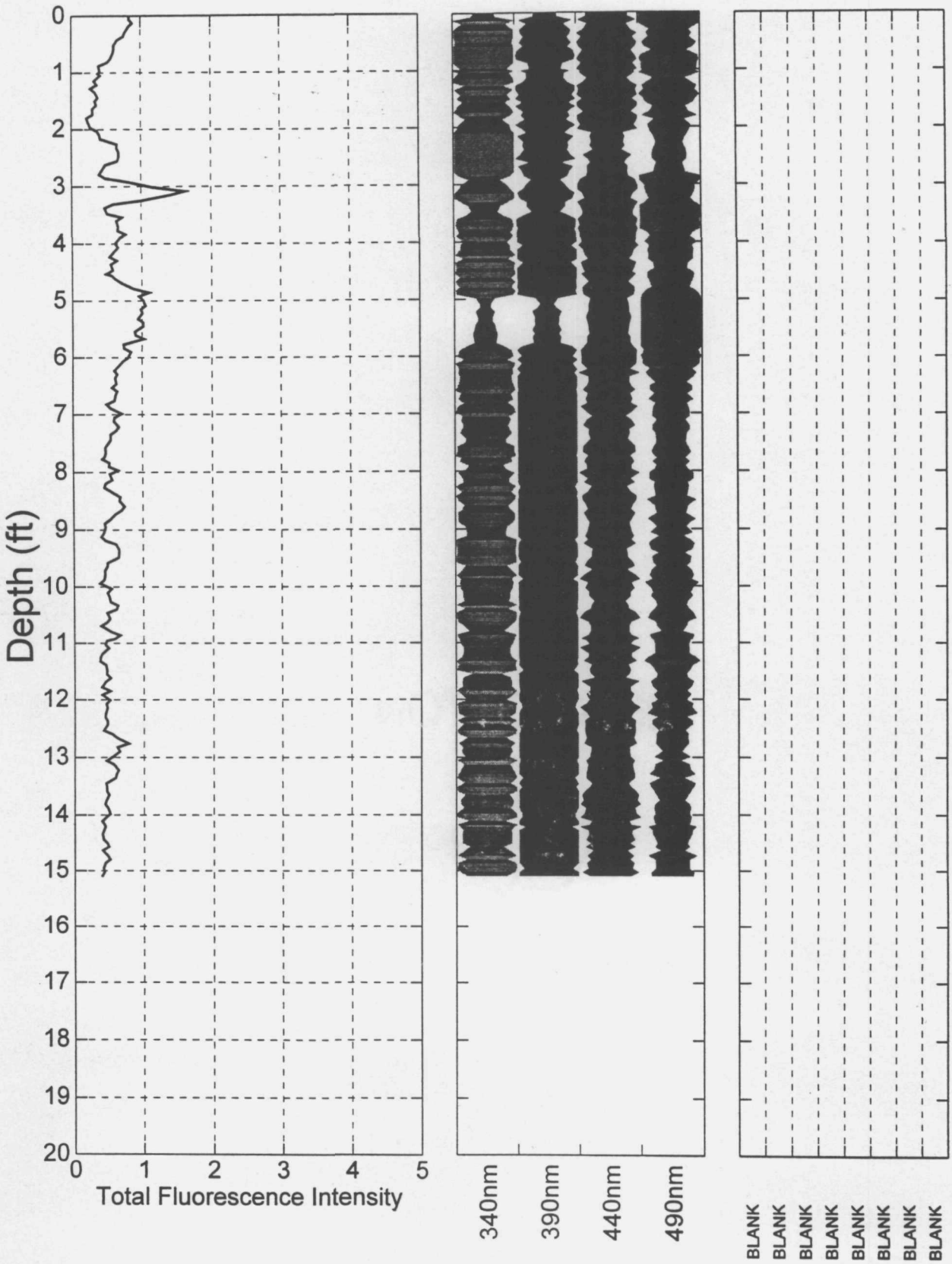


Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
1.623%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT07

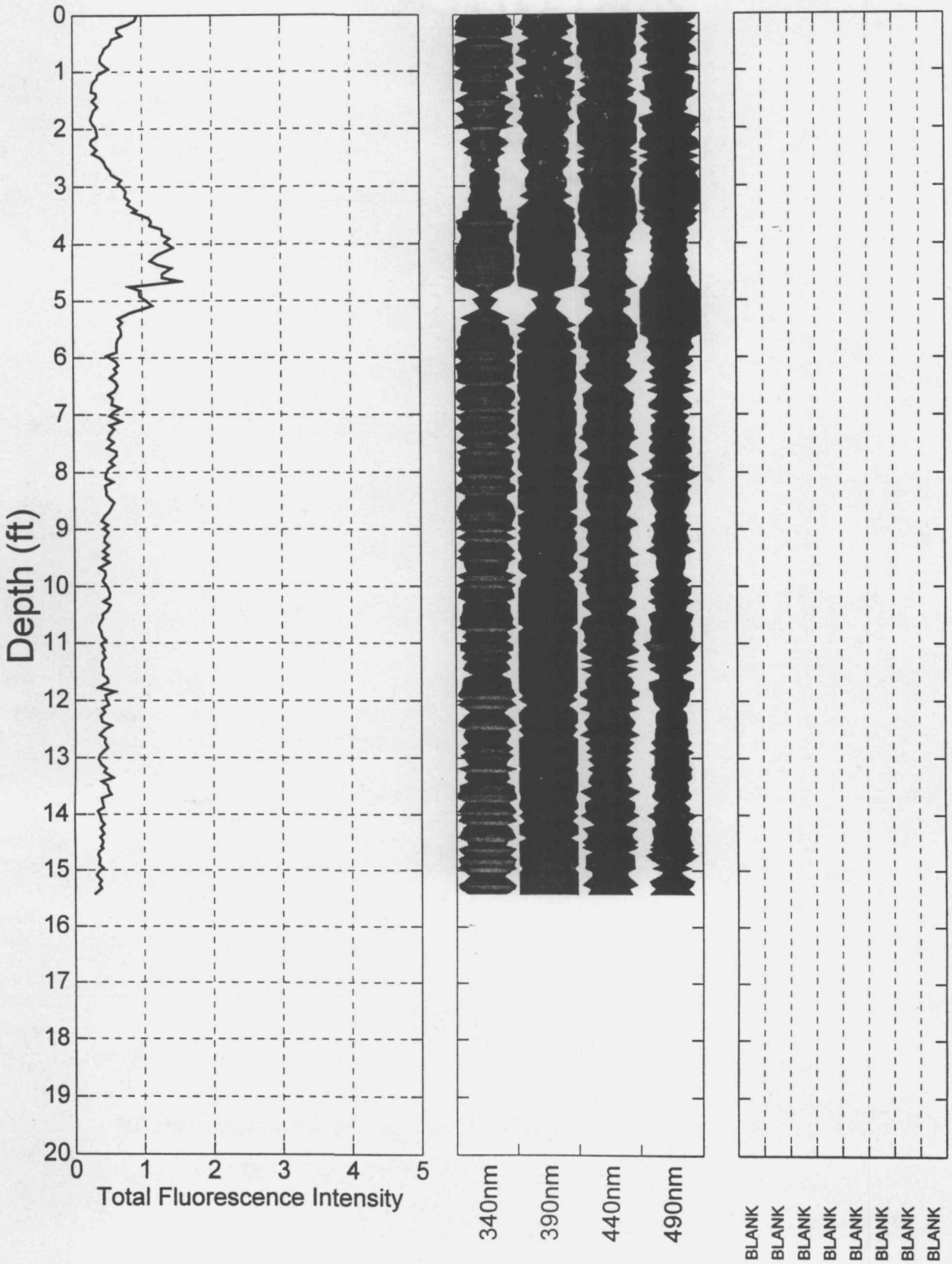


Measured LIF End Depth
15.42 ft
Measured Peak Fluorescence
1.537%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT08

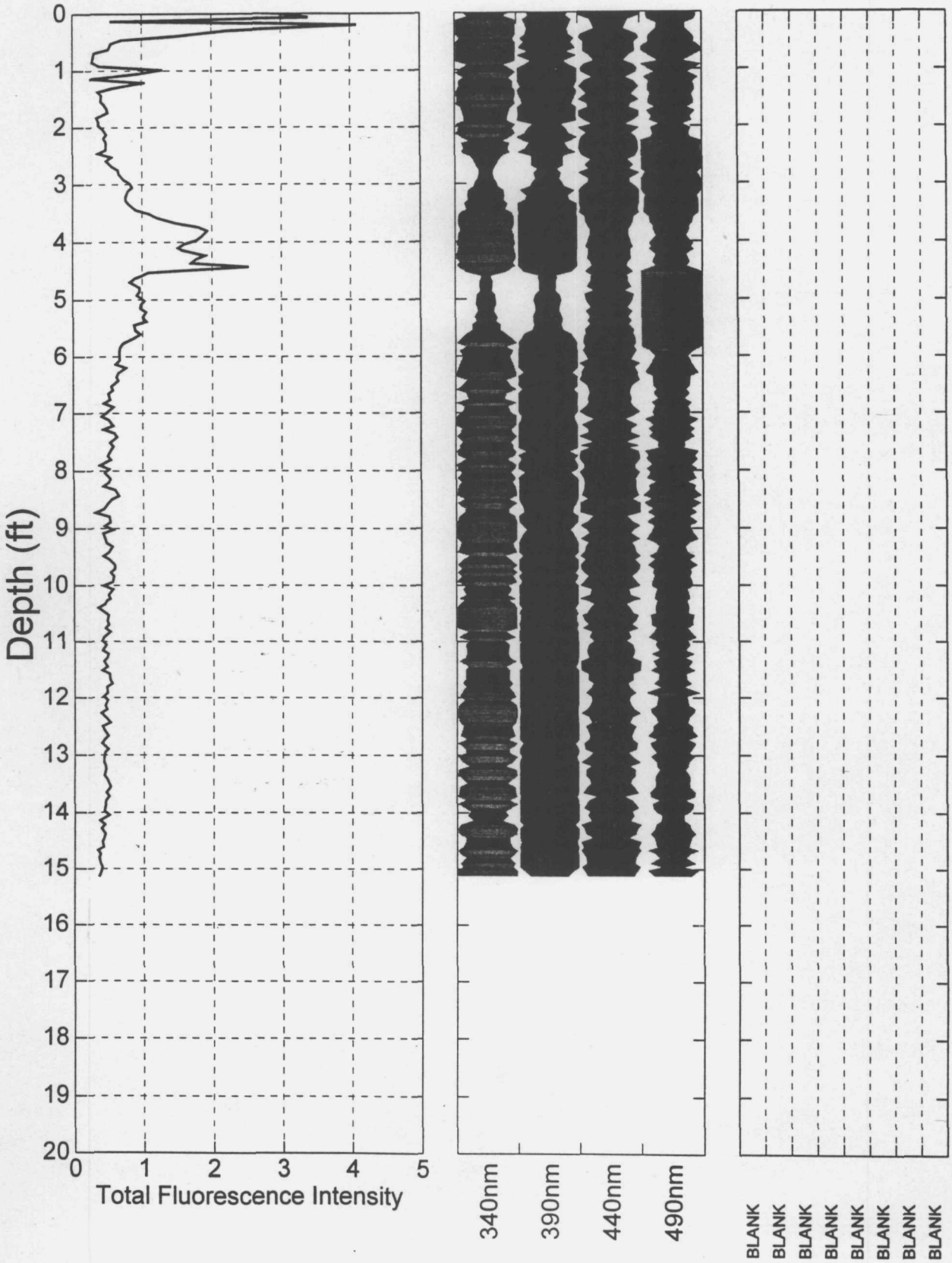


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
4.092%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT09

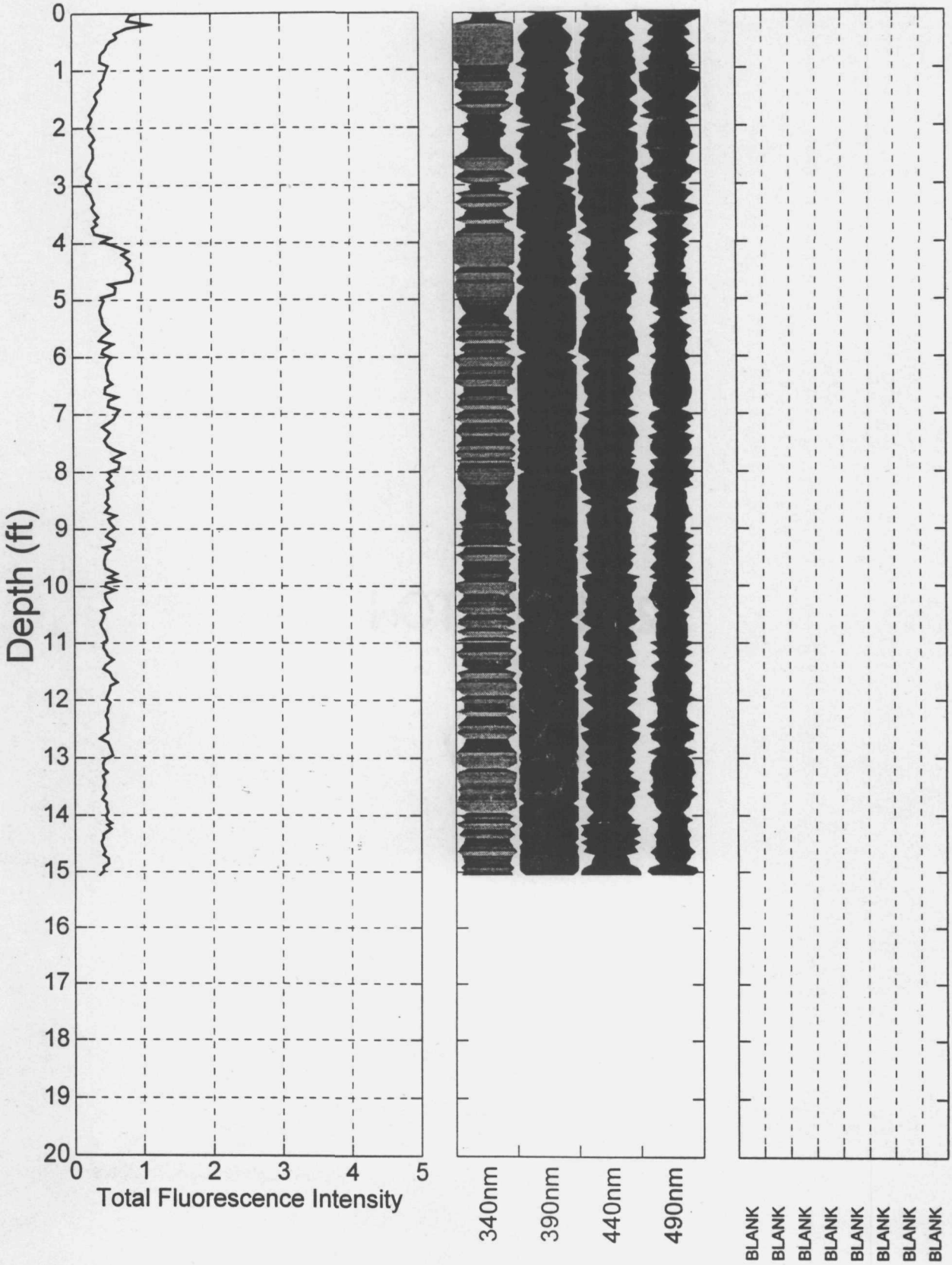


Measured LIF End Depth
15.06 ft
Measured Peak Fluorescence
1.111%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT10

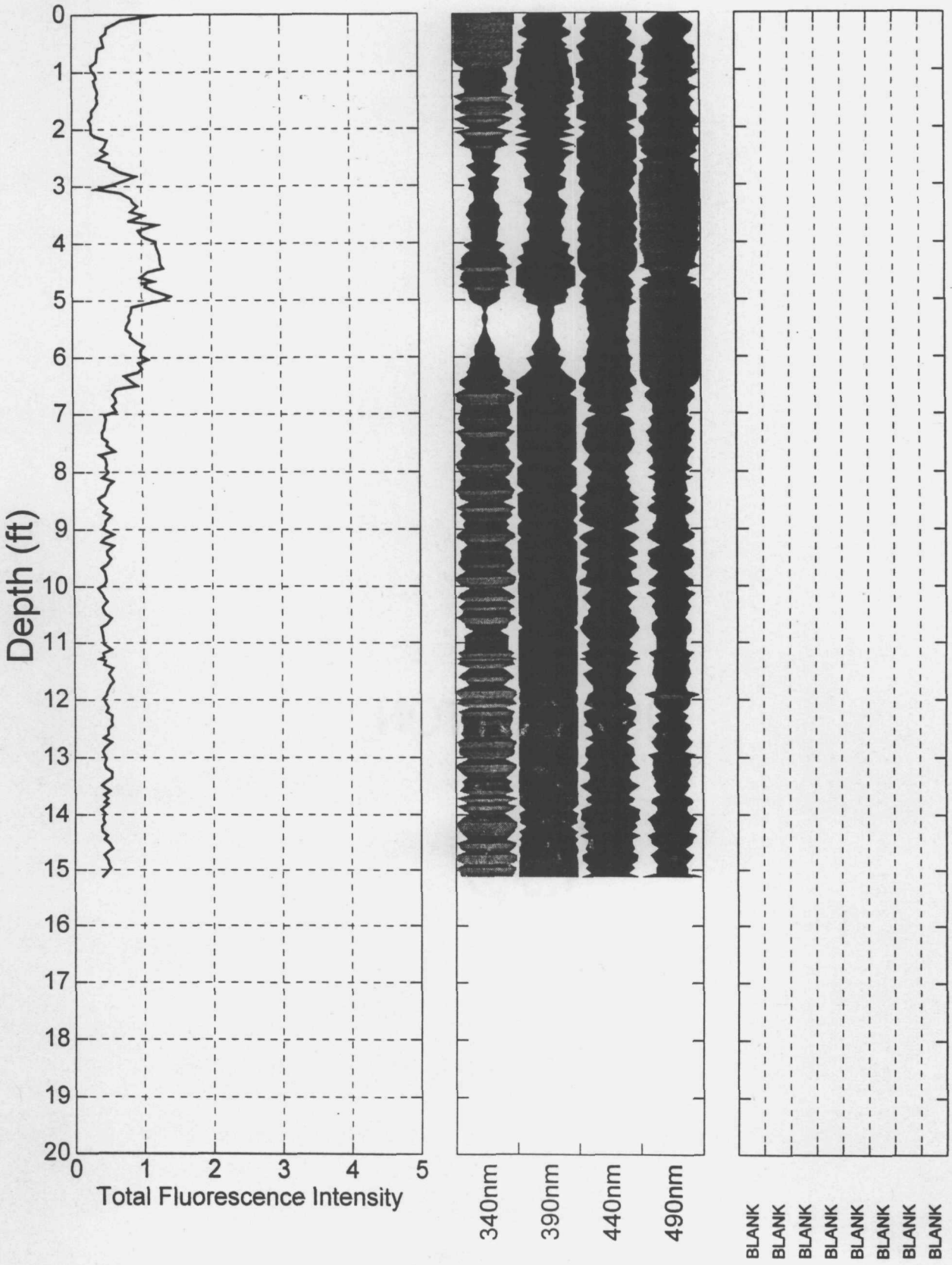


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
1.403%

Job#: 0301-8077

Acquisition Date: 04-27-1998

CPT11

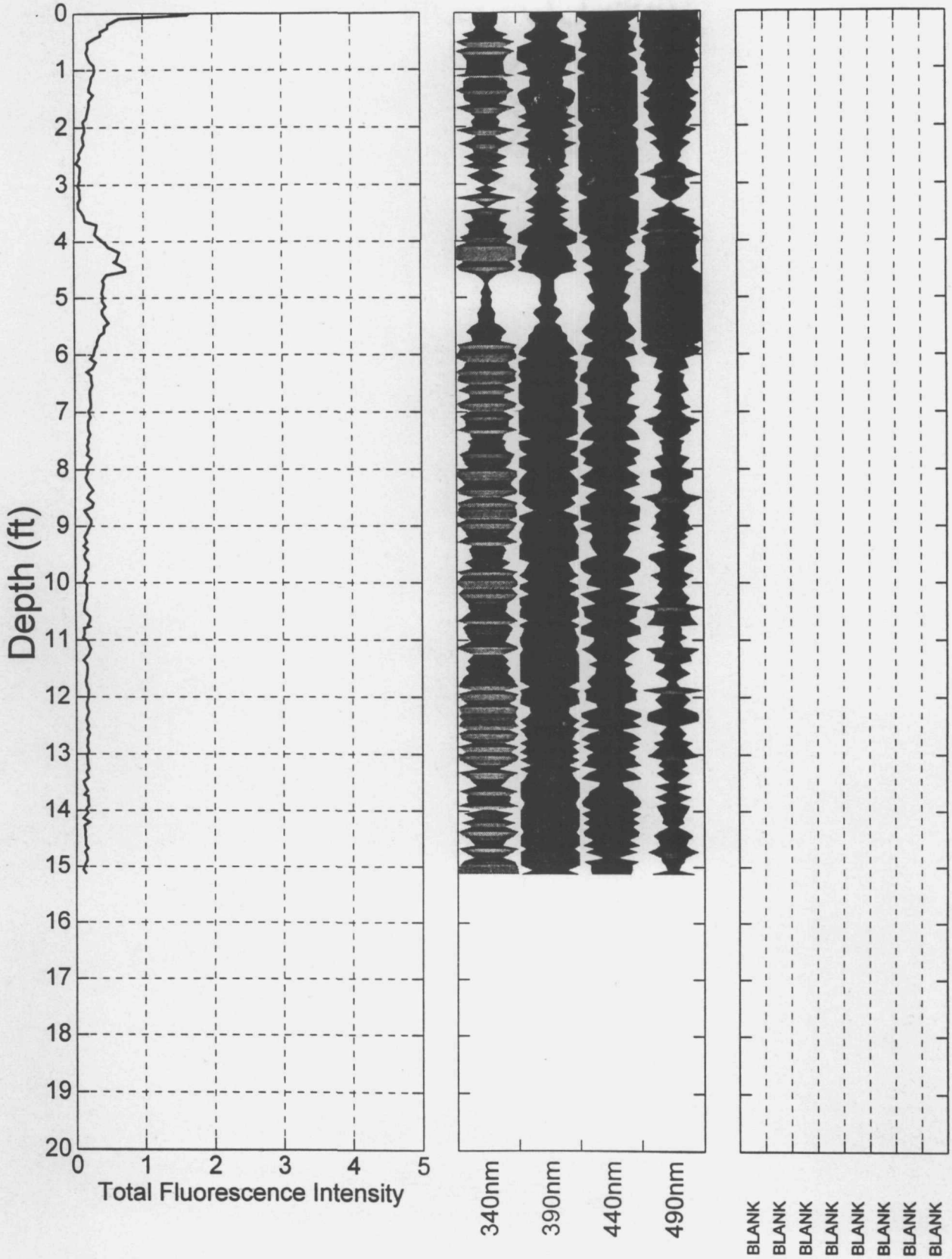


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
1.636%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT12

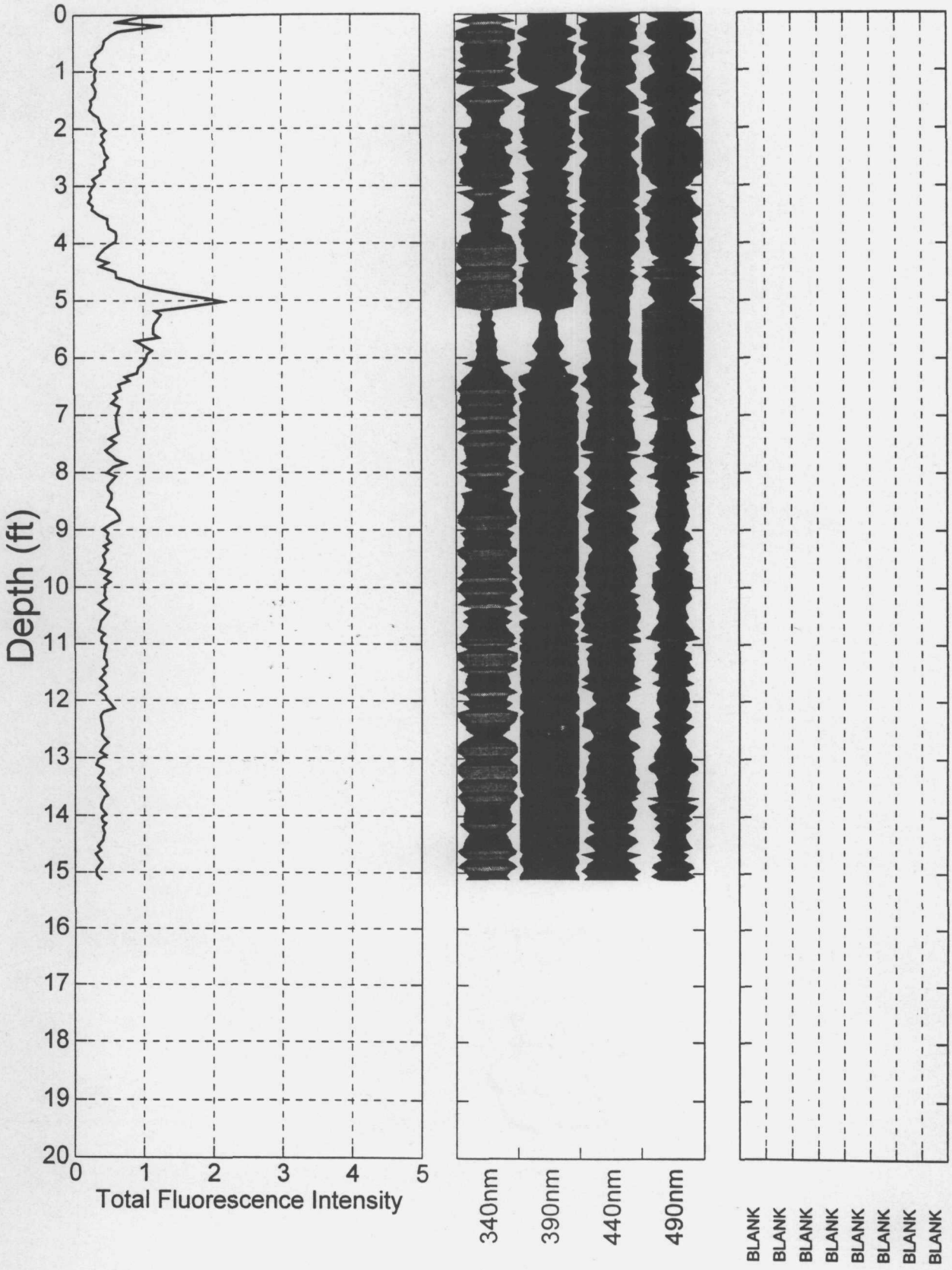


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
2.144%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT13

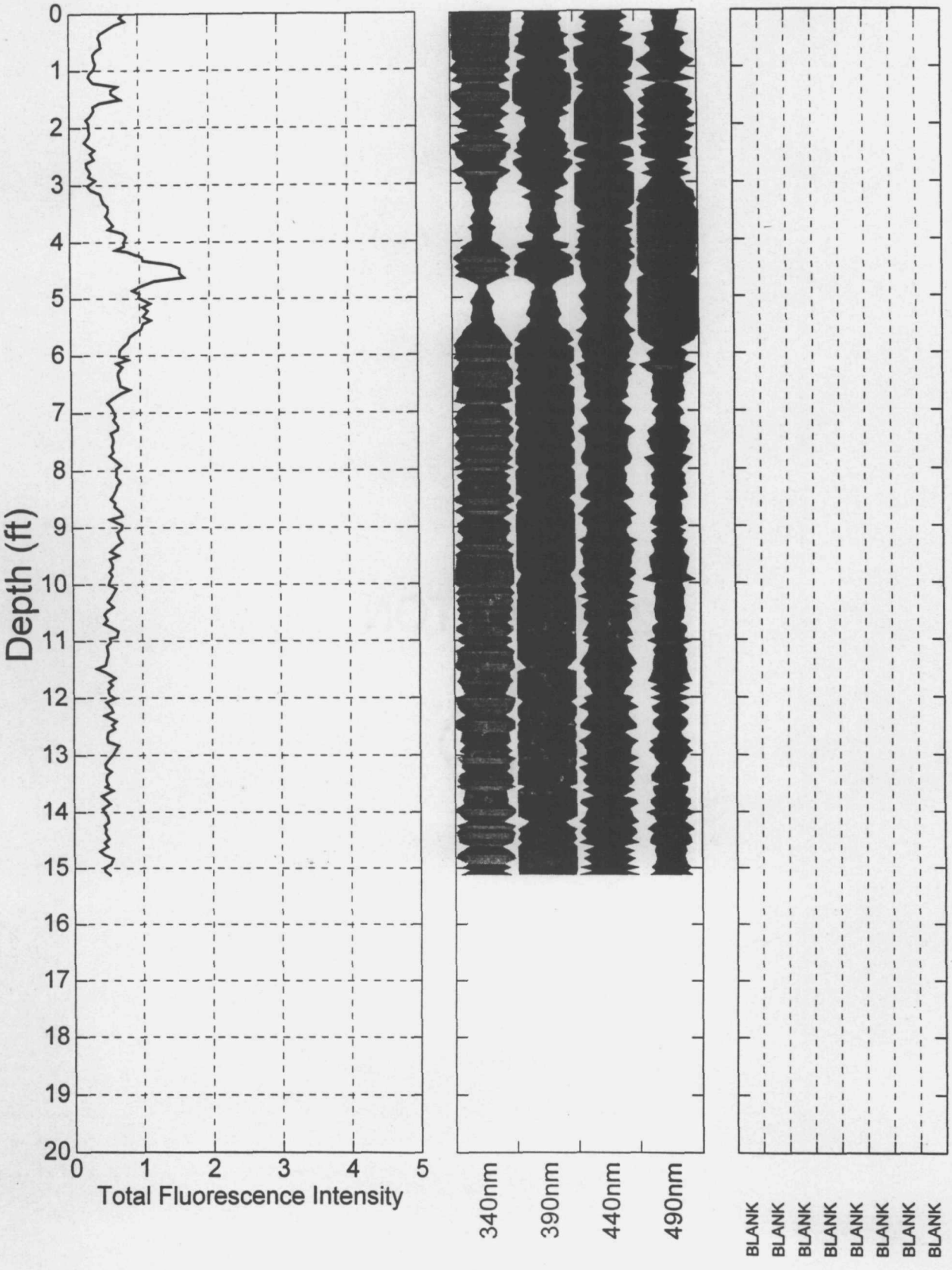


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
1.634%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT14

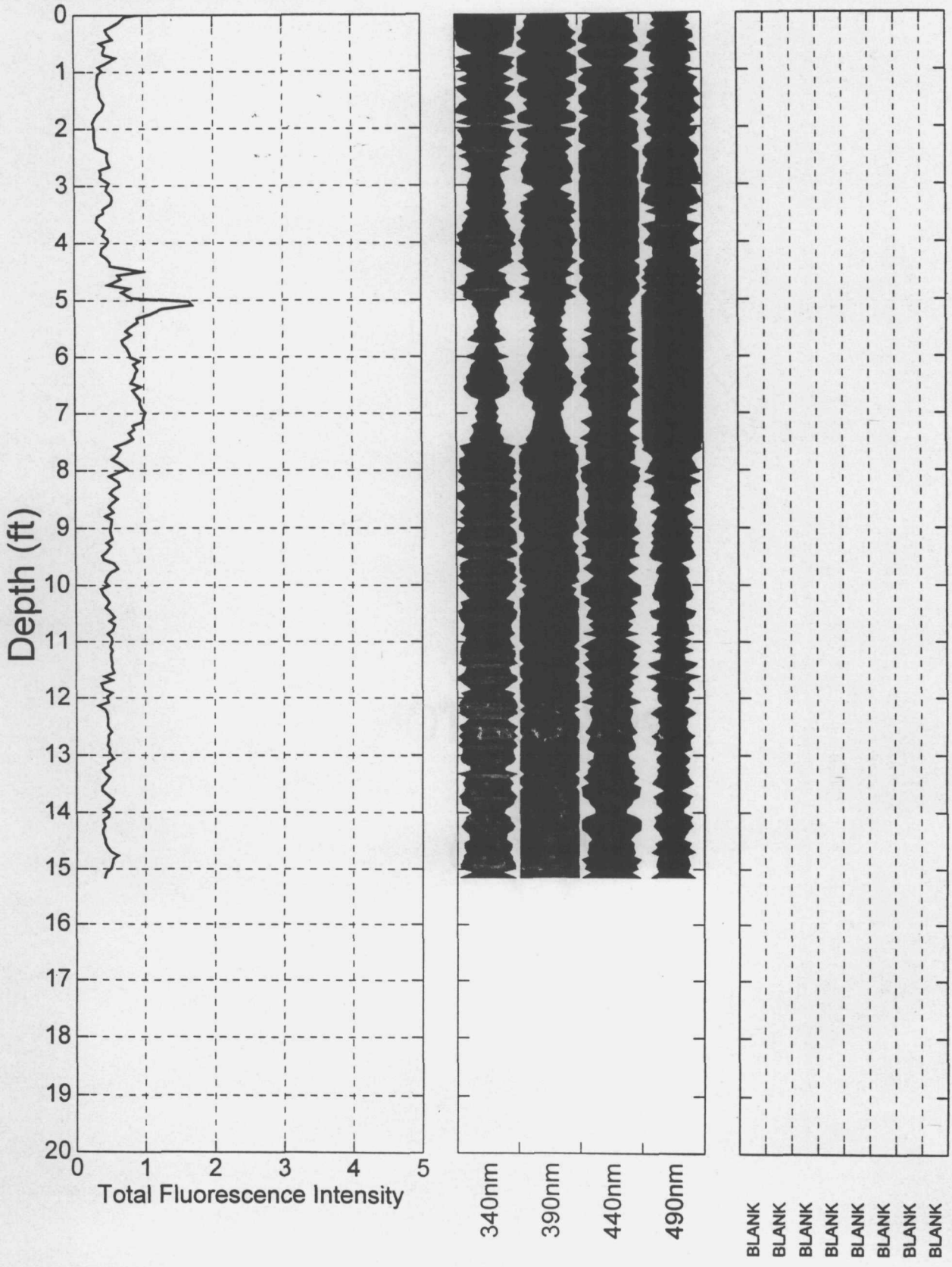


Measured LIF End Depth
15.16 ft
Measured Peak Fluorescence
1.695%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT15

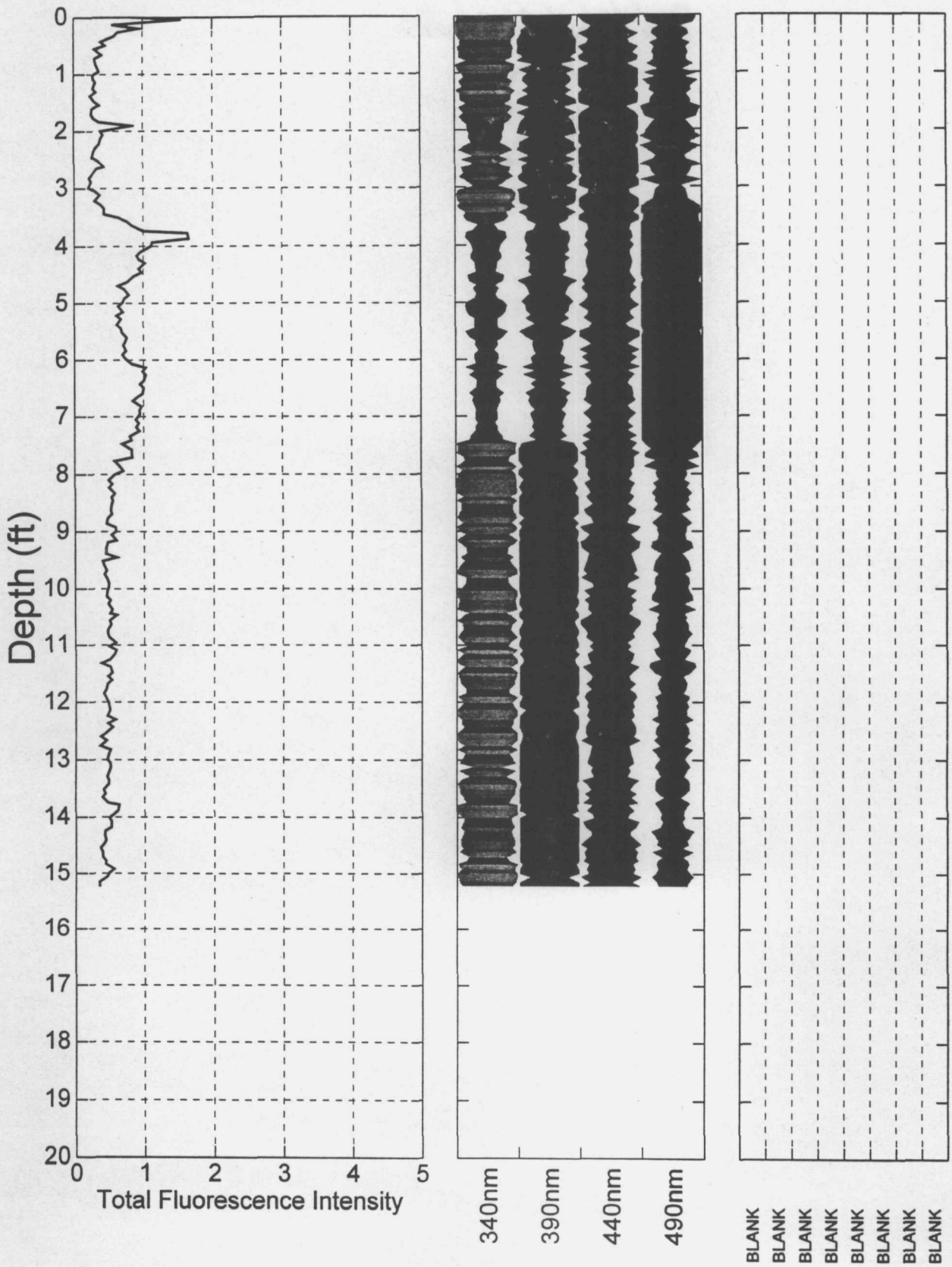


Measured LIF End Depth
15.22 ft
Measured Peak Fluorescence
1.65%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT16

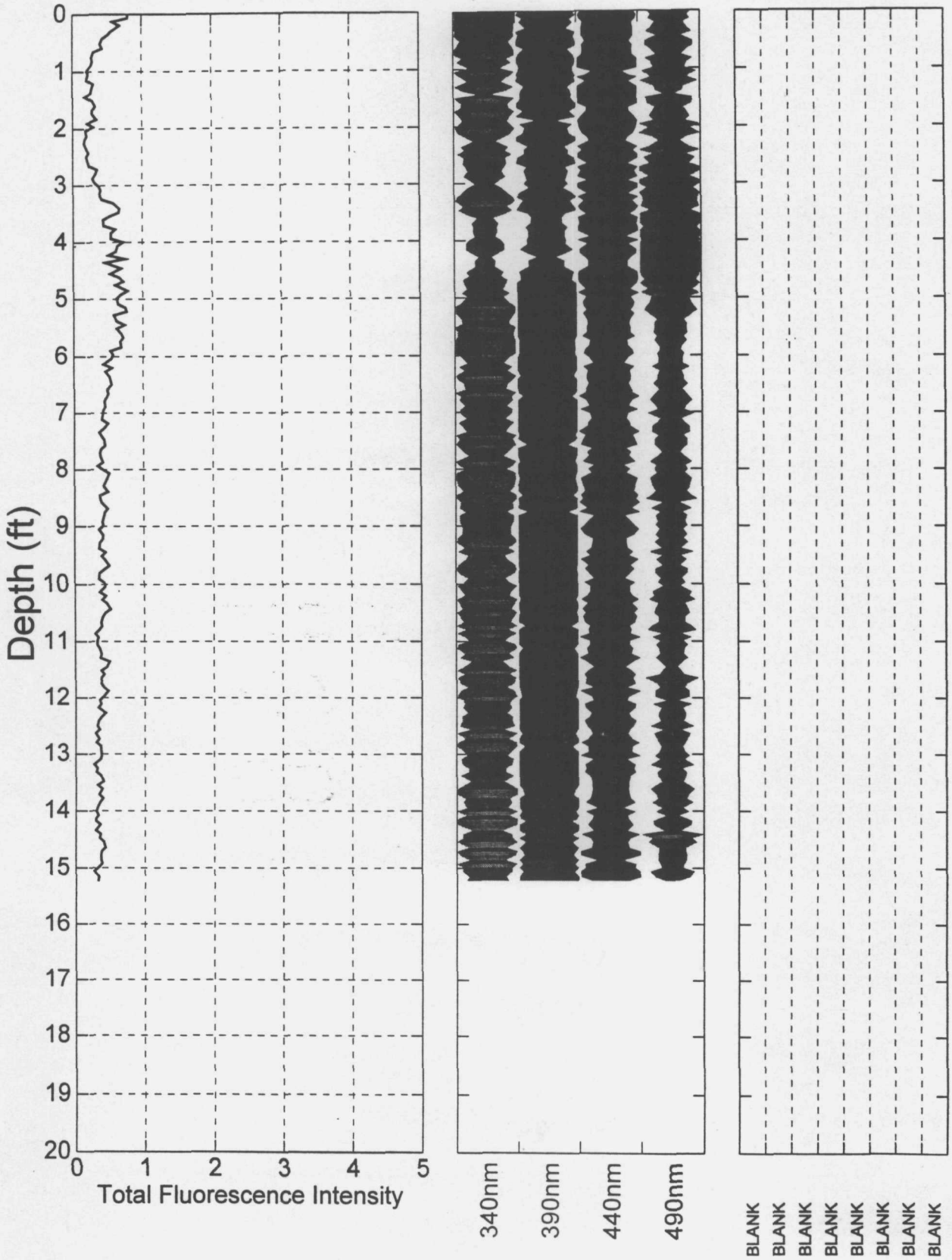


Measured LIF End Depth
15.22 ft
Measured Peak Fluorescence
0.795%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT17

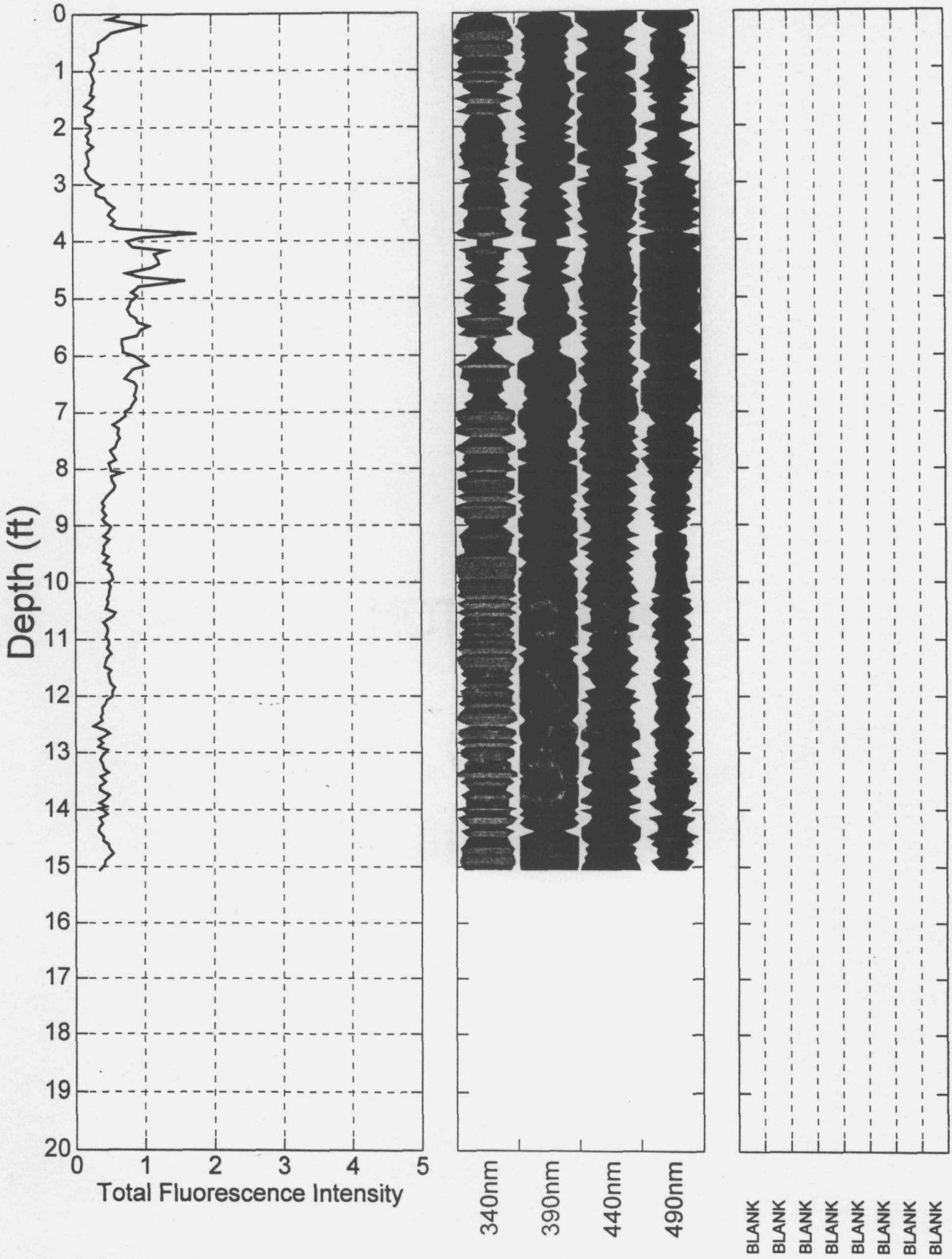


Measured LIF End Depth
15.06 ft
Measured Peak Fluorescence
1.781%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT17A

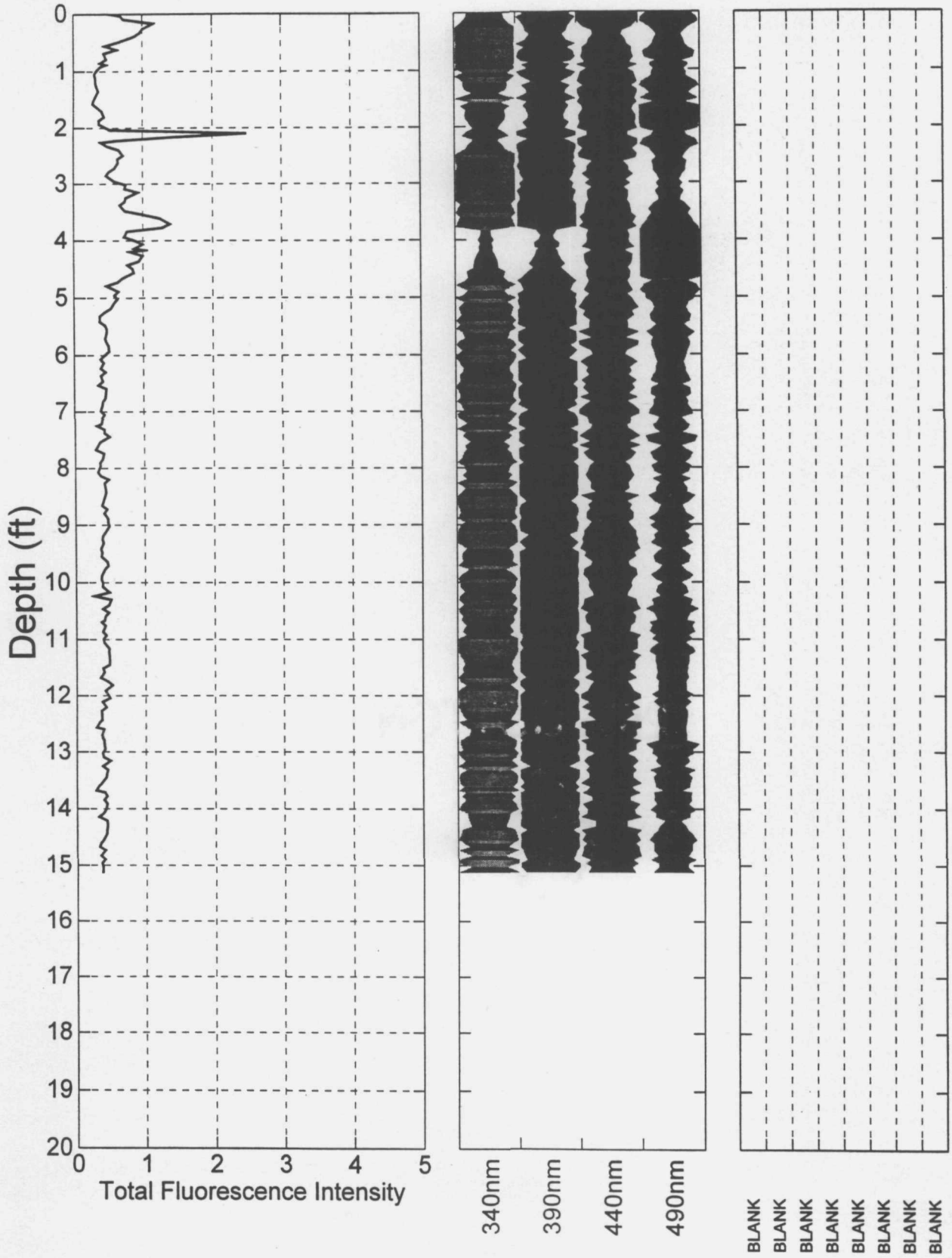


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
2.491%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT18

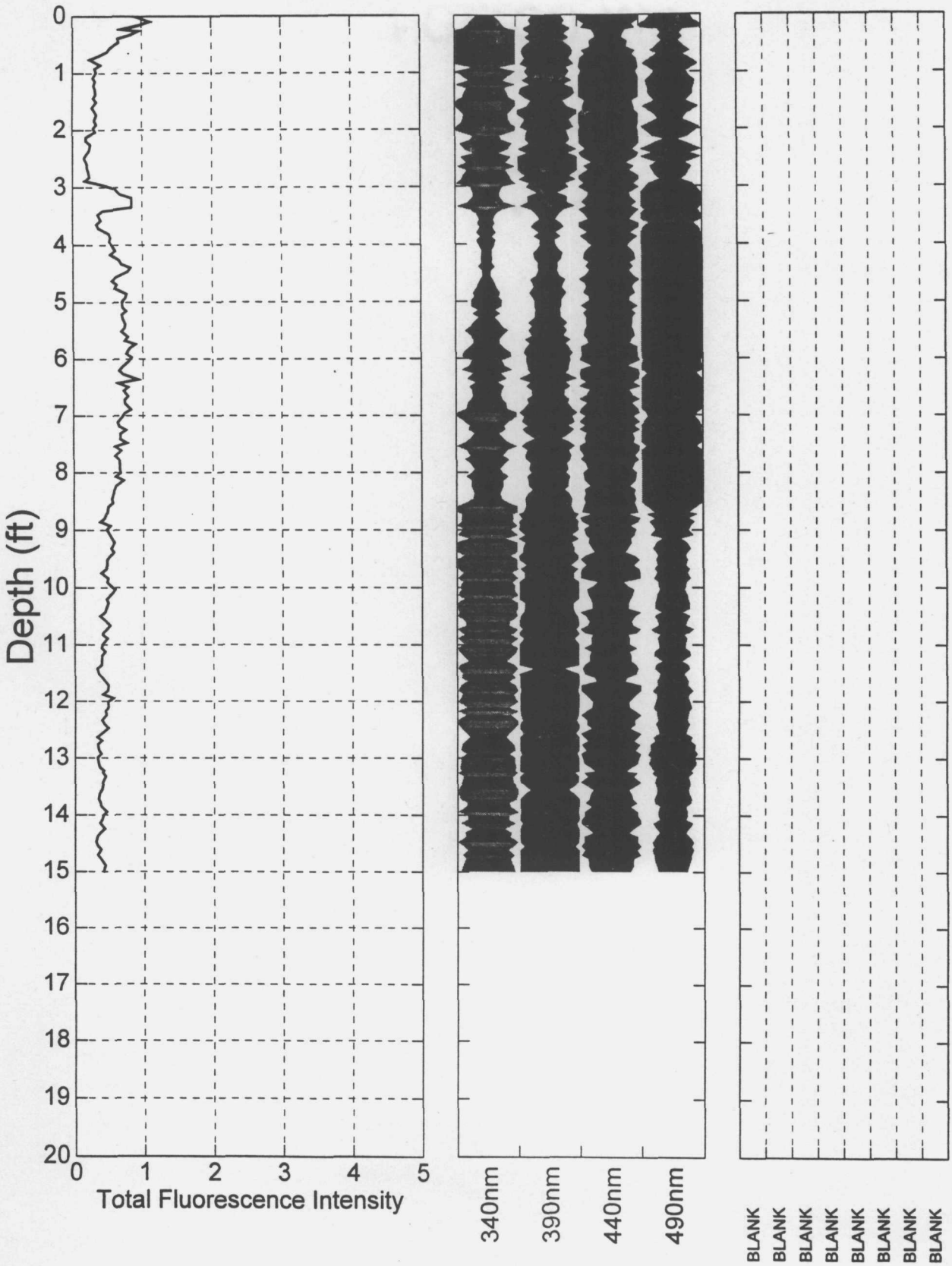


Measured LIF End Depth
14.99 ft
Measured Peak Fluorescence
1.118%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT19

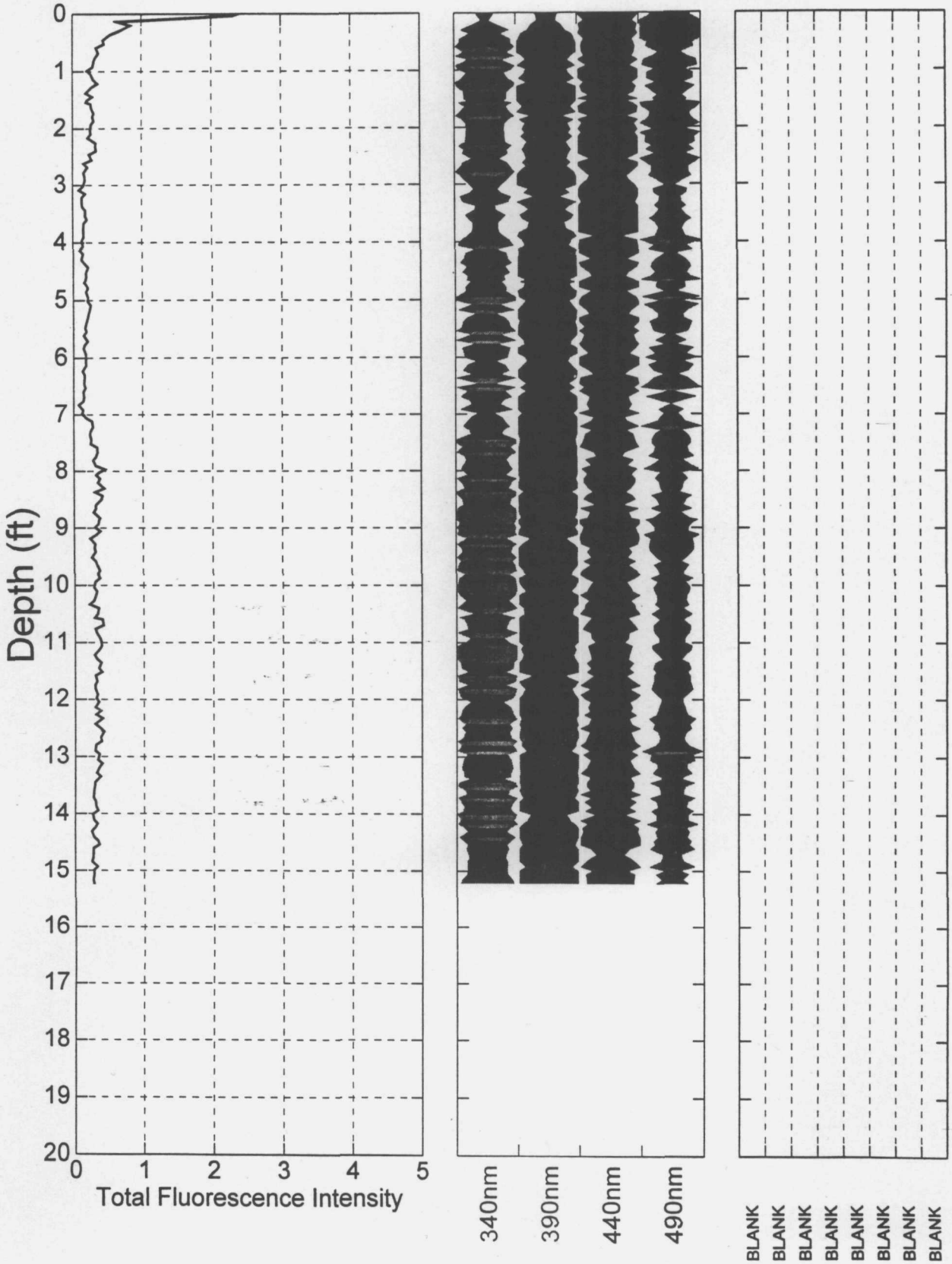


Measured LIF End Depth
15.22 ft
Measured Peak Fluorescence
2.307%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT20

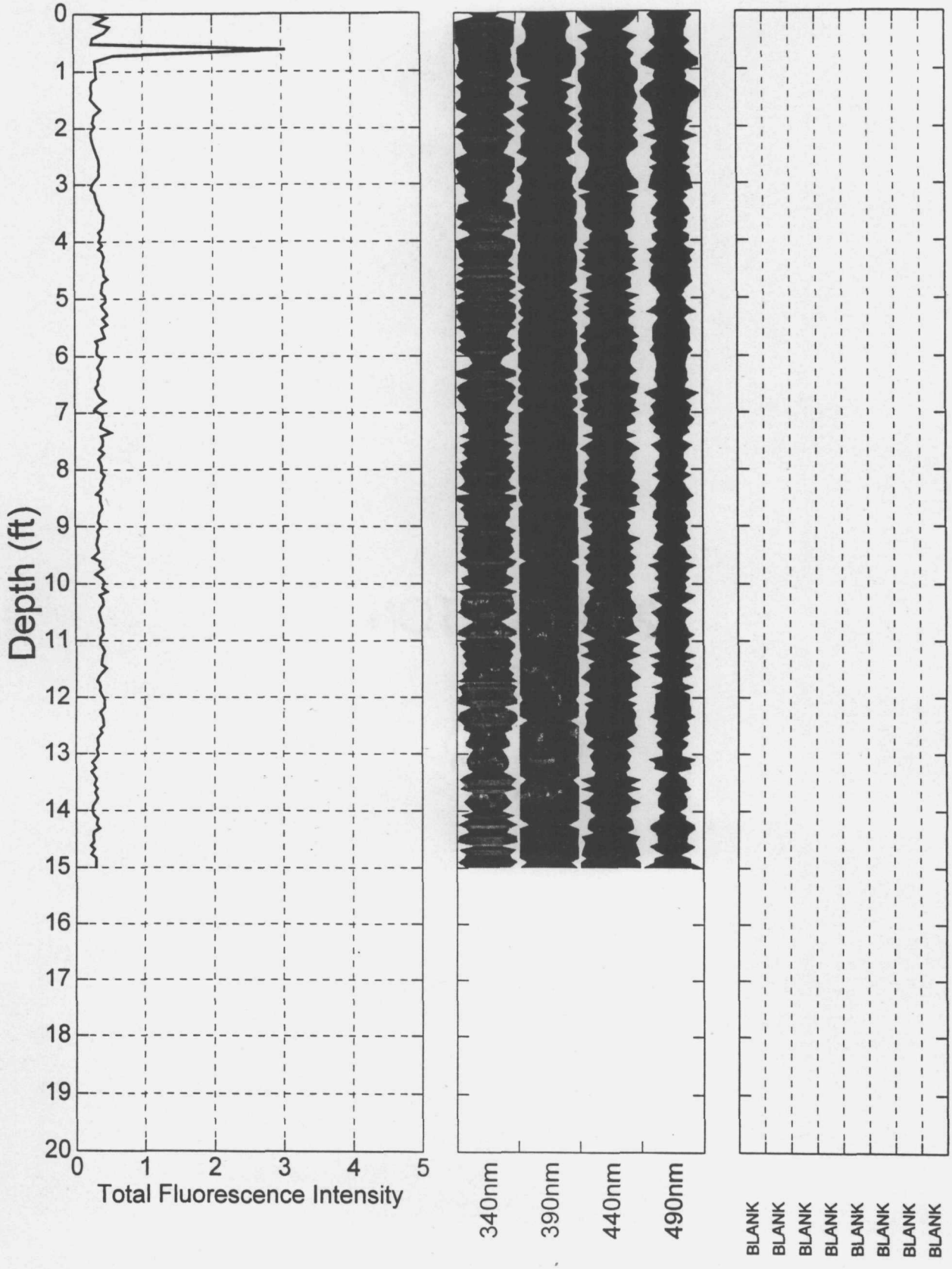


Measured LIF End Depth
14.99 ft
Measured Peak Fluorescence
3.058%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT21

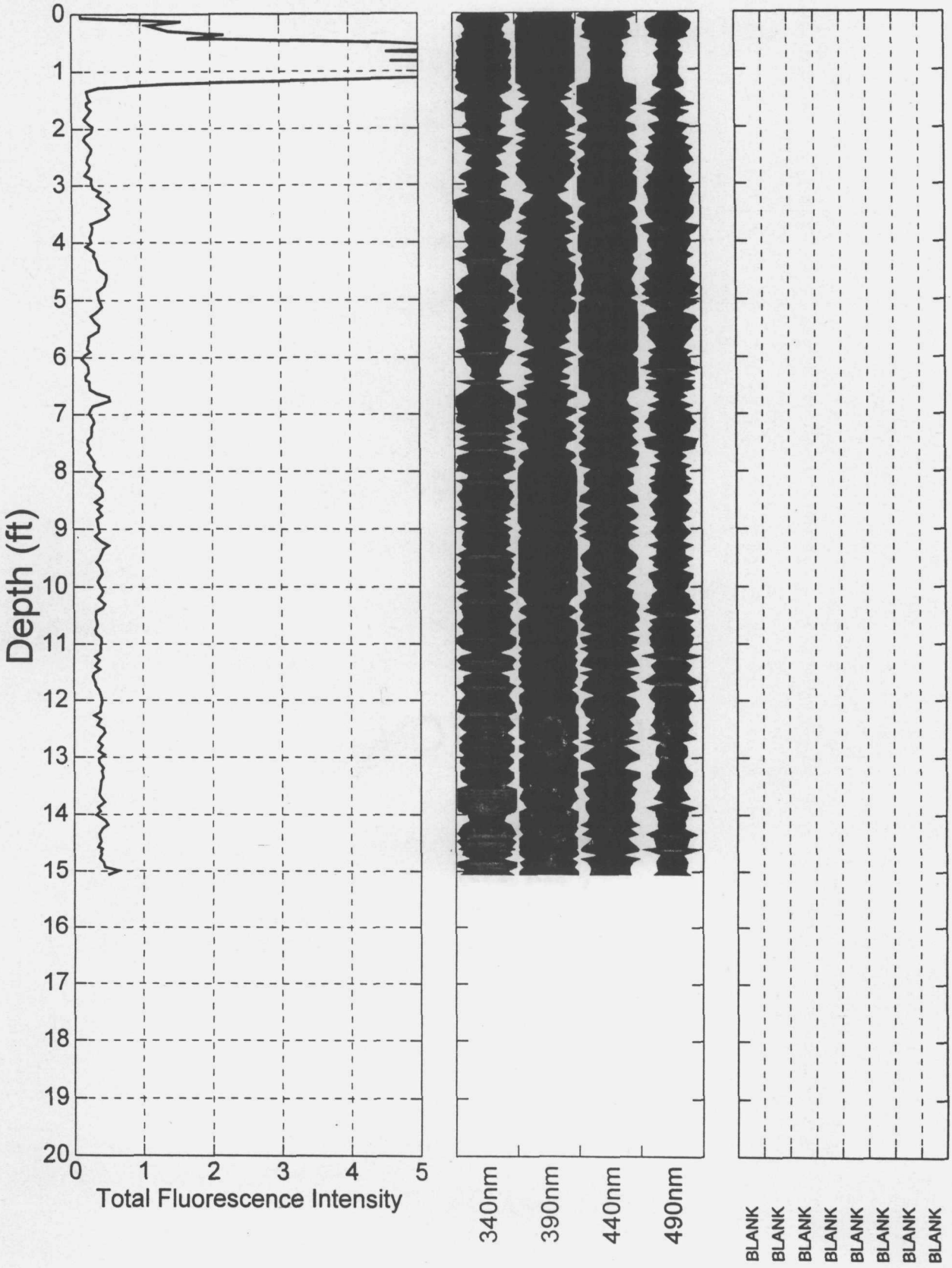


Measured LIF End Depth
15.06 ft
Measured Peak Fluorescence
12.05%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT22

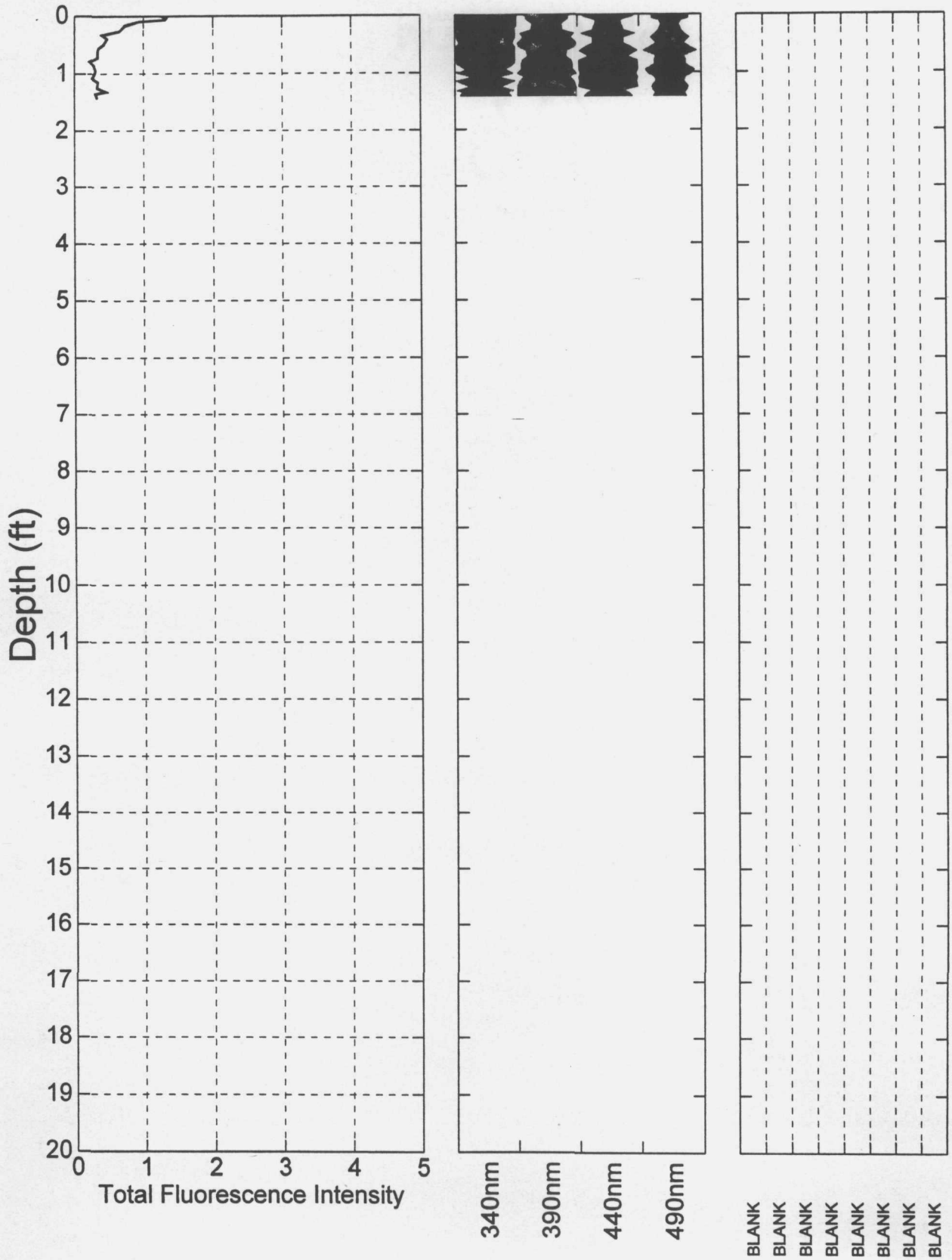


Measured LIF End Depth
1.411 ft
Measured Peak Fluorescence
1.324%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT23

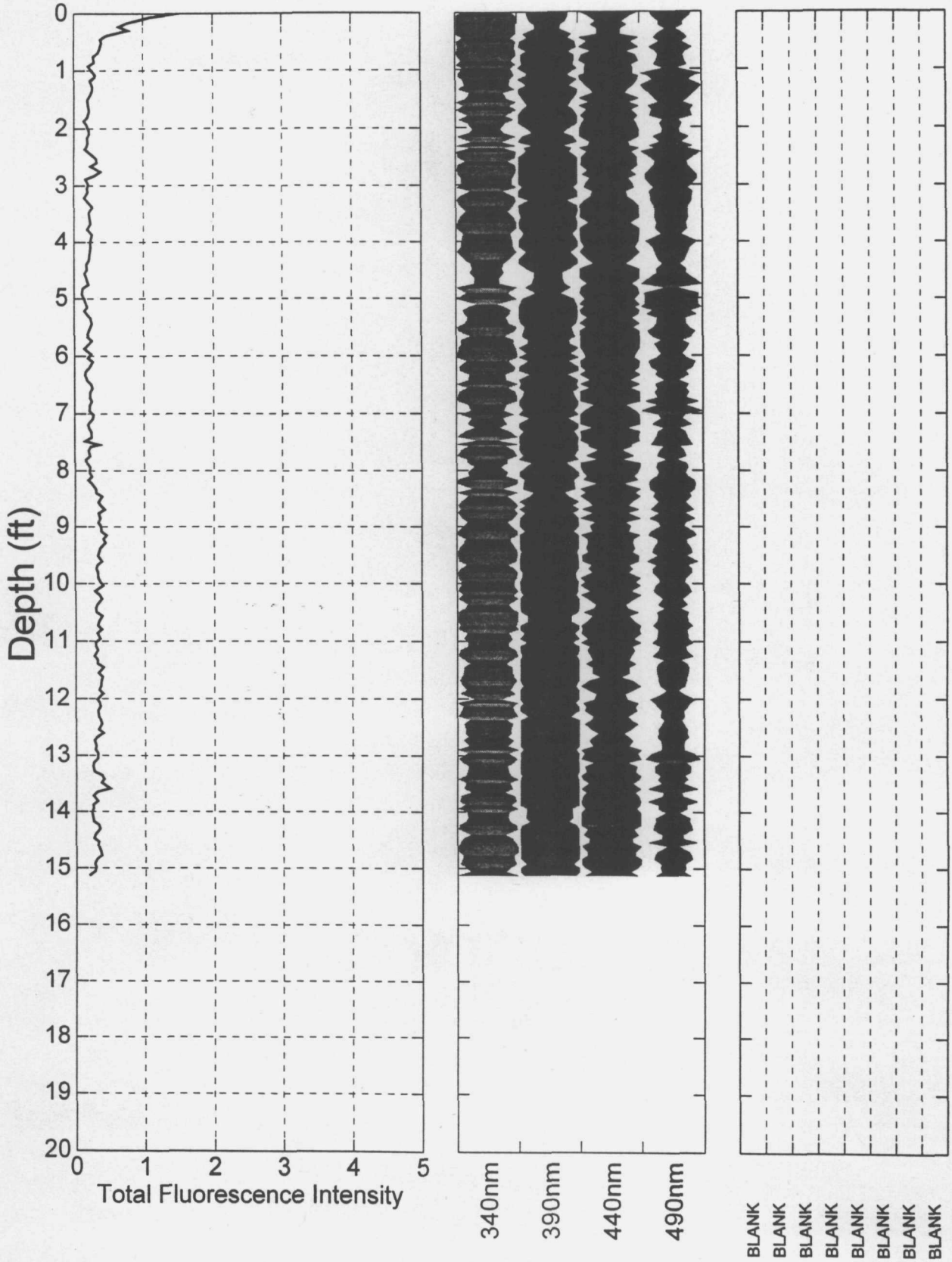


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
1.094%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT23A -

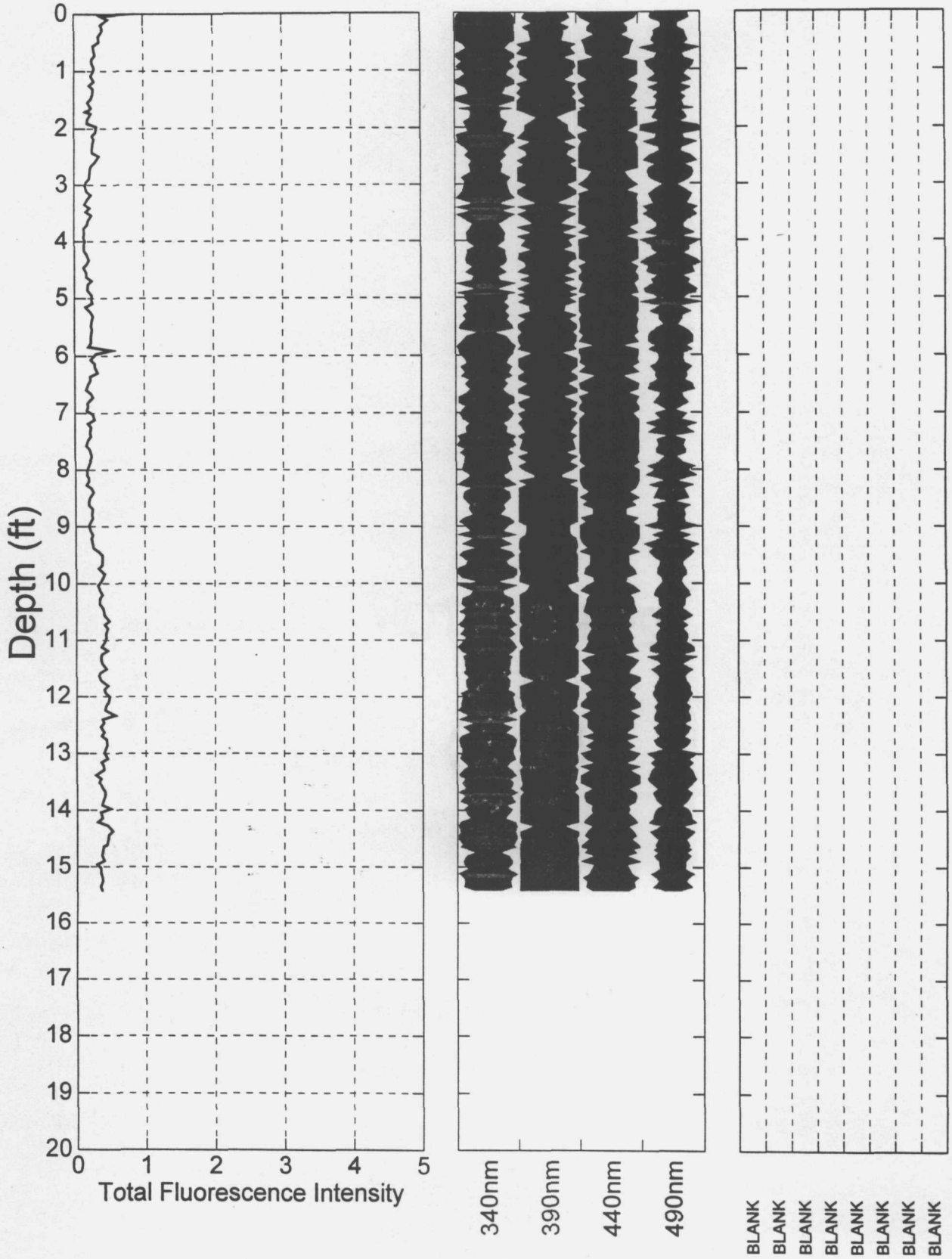


Measured LIF End Depth
15.42 ft
Measured Peak Fluorescence
0.5541%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT24

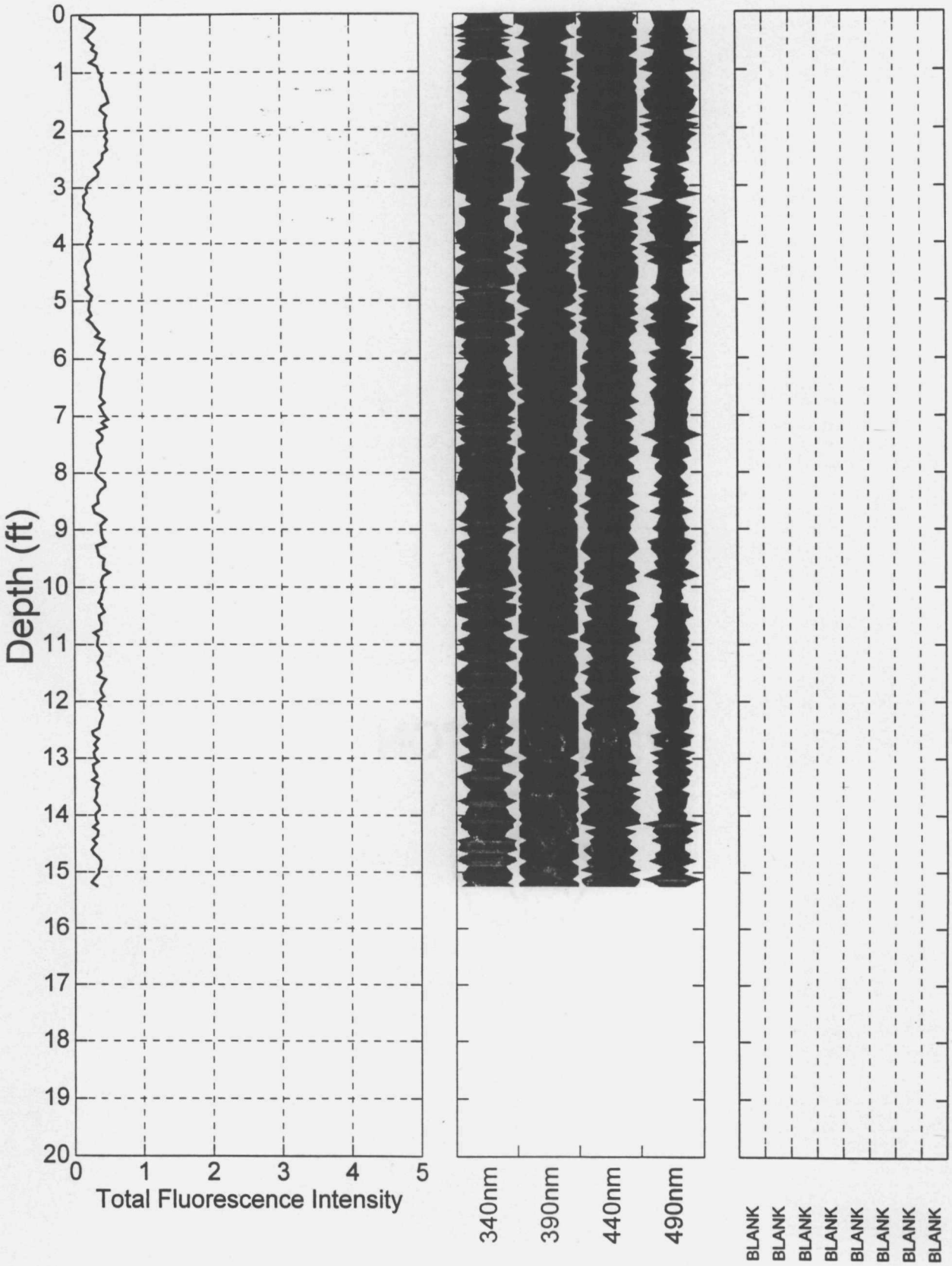


Measured LIF End Depth
15.26 ft
Measured Peak Fluorescence
0.5303%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT25 -

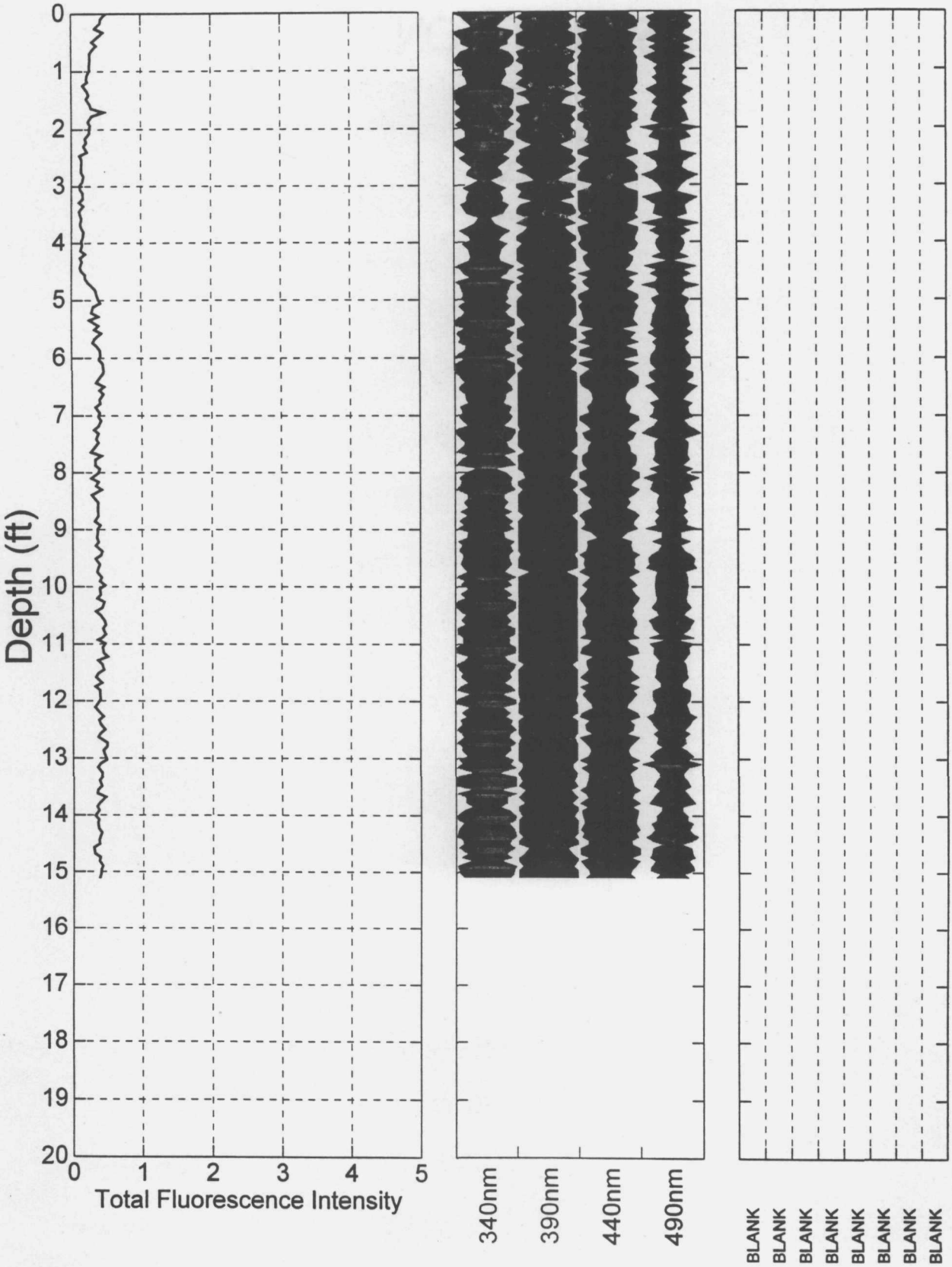


Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
0.4943%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT26

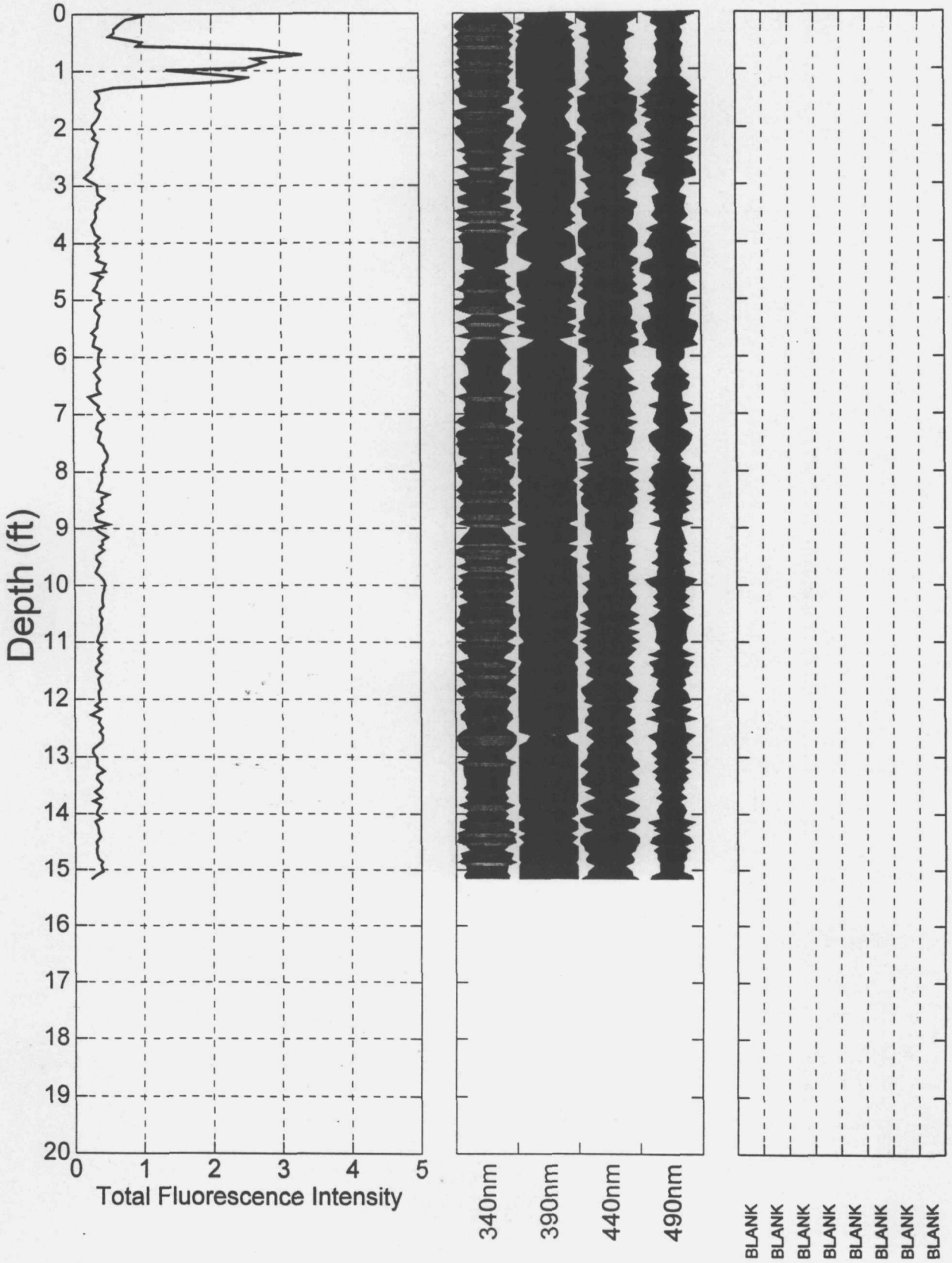


Measured LIF End Depth
15.16 ft
Measured Peak Fluorescence
3.321%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT27

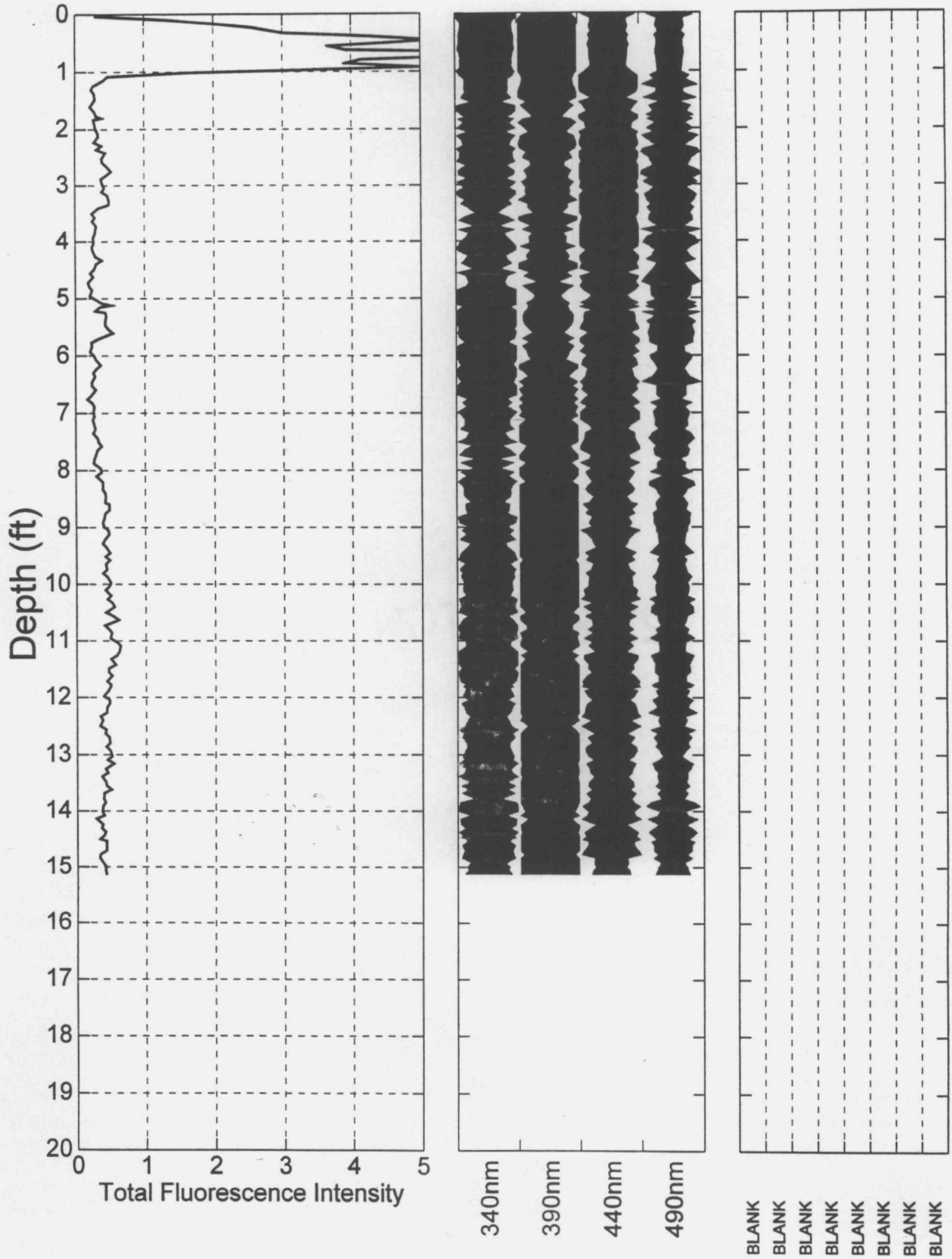


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
7.007%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT28

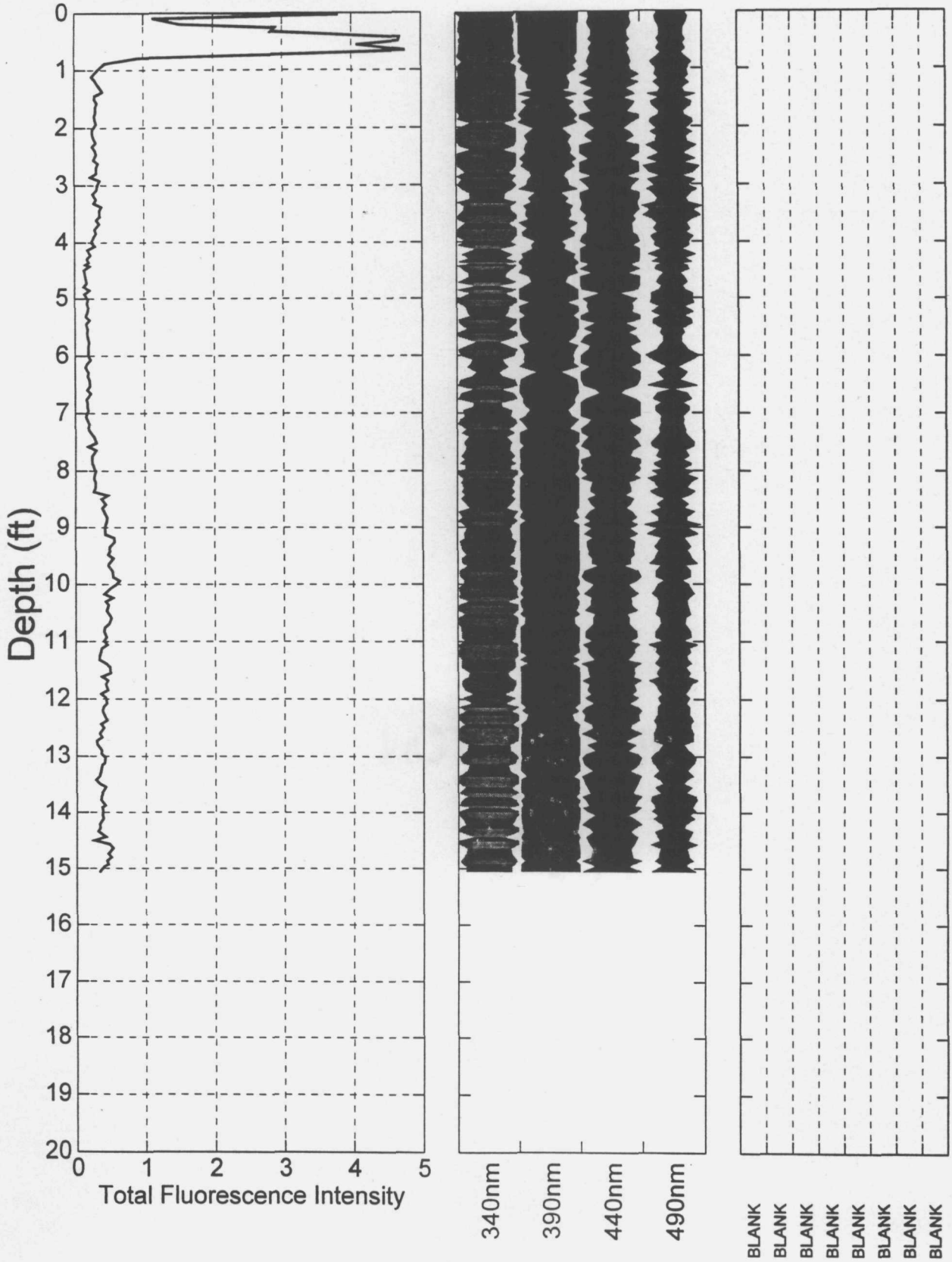


Measured LIF End Depth
15.06 ft
Measured Peak Fluorescence
4.772%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT29 -

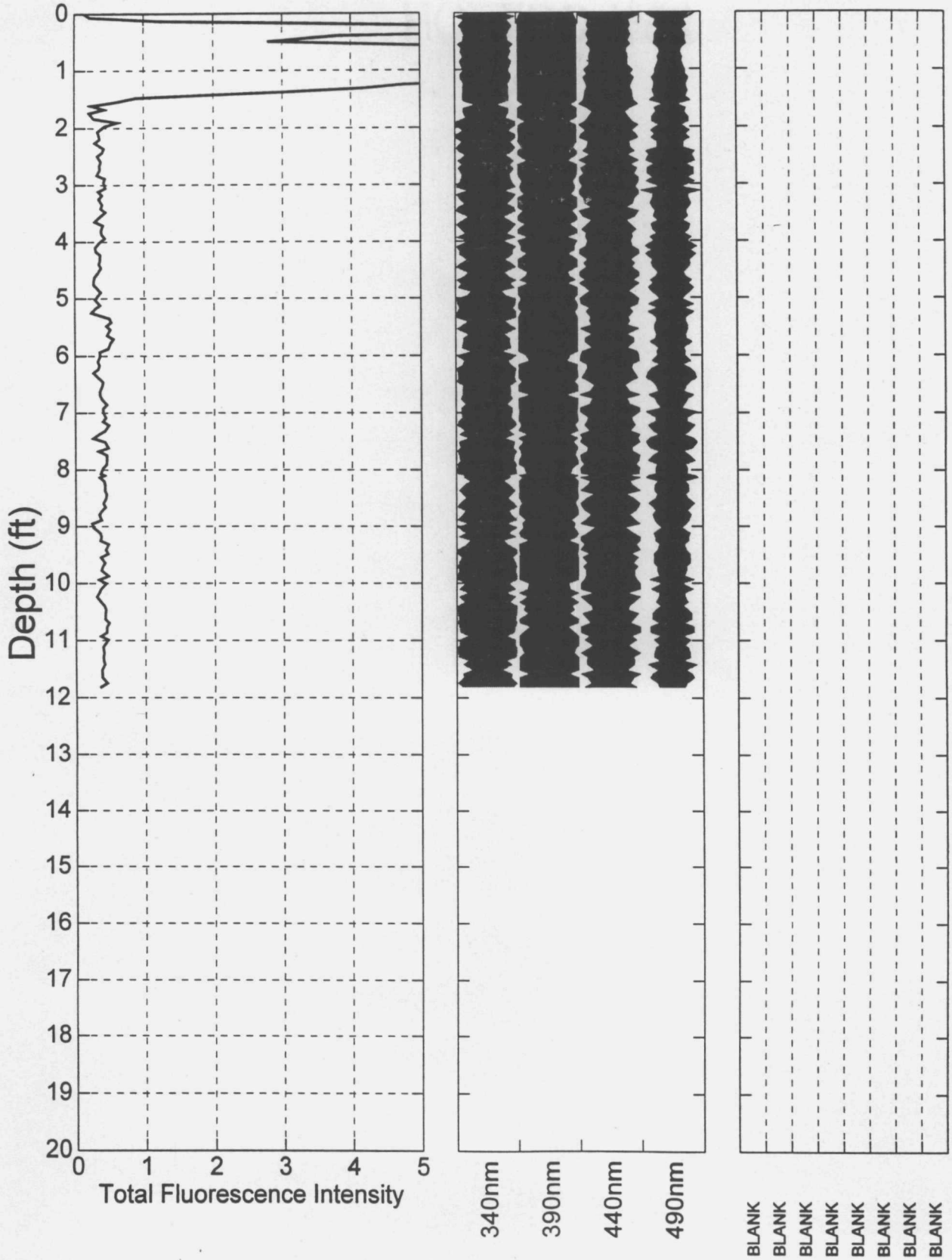


Measured LIF End Depth
11.81 ft
Measured Peak Fluorescence
14.57%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT30

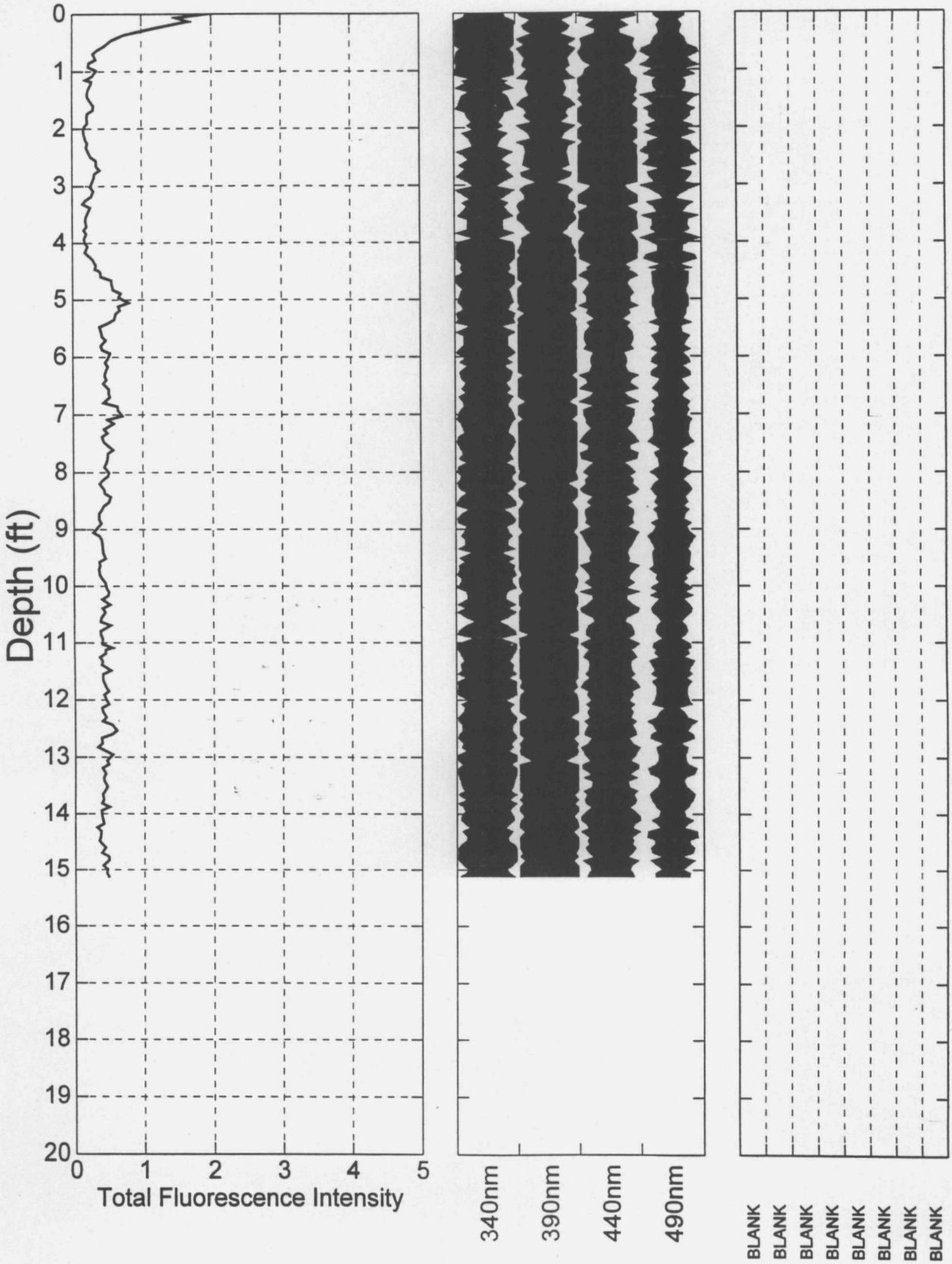


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
1.665%

Job#: 0301-8077

Acquisition Date: 04-28-1998

CPT31

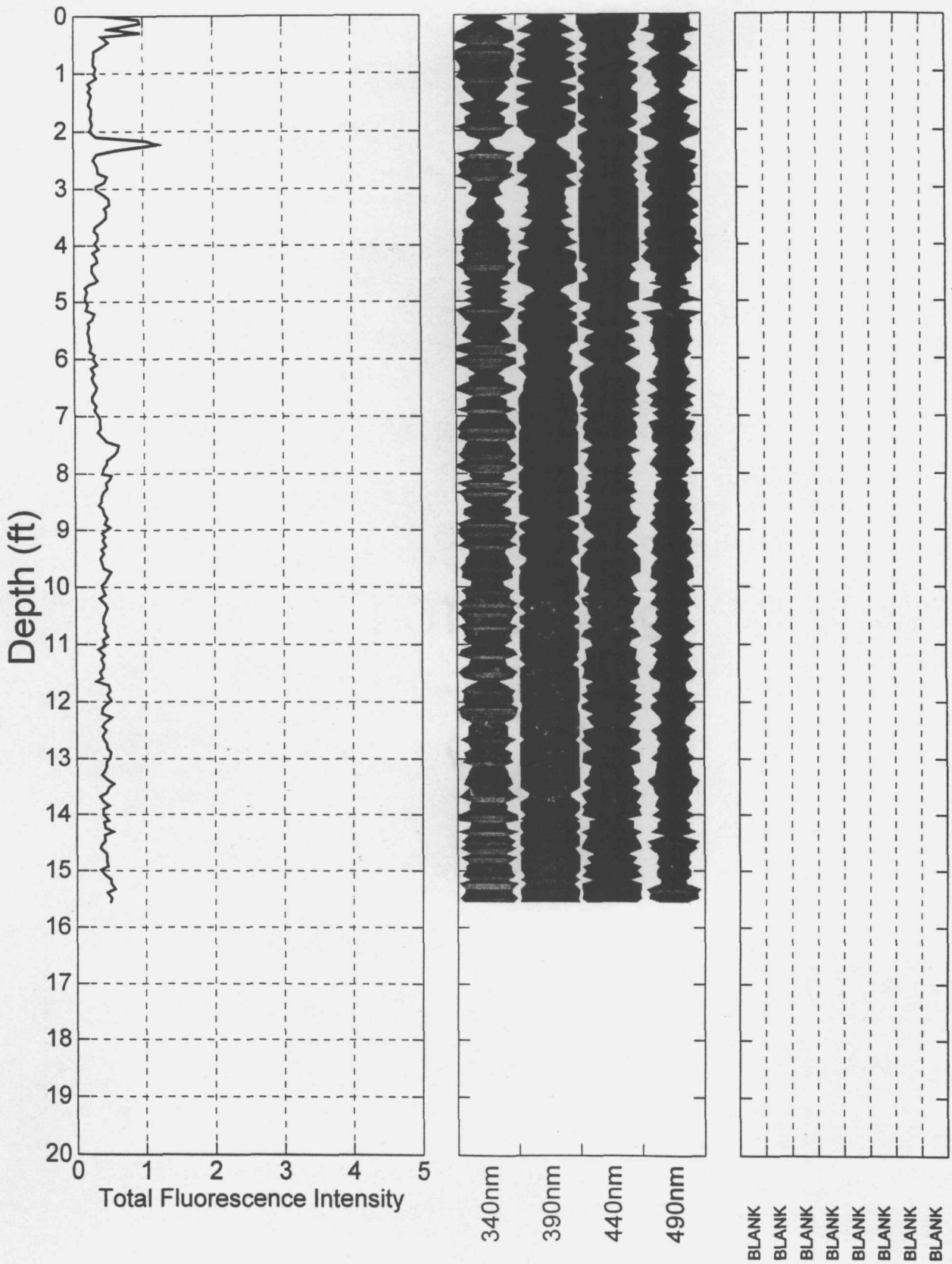


Measured LIF End Depth
15.55 ft
Measured Peak Fluorescence
1.207%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT32

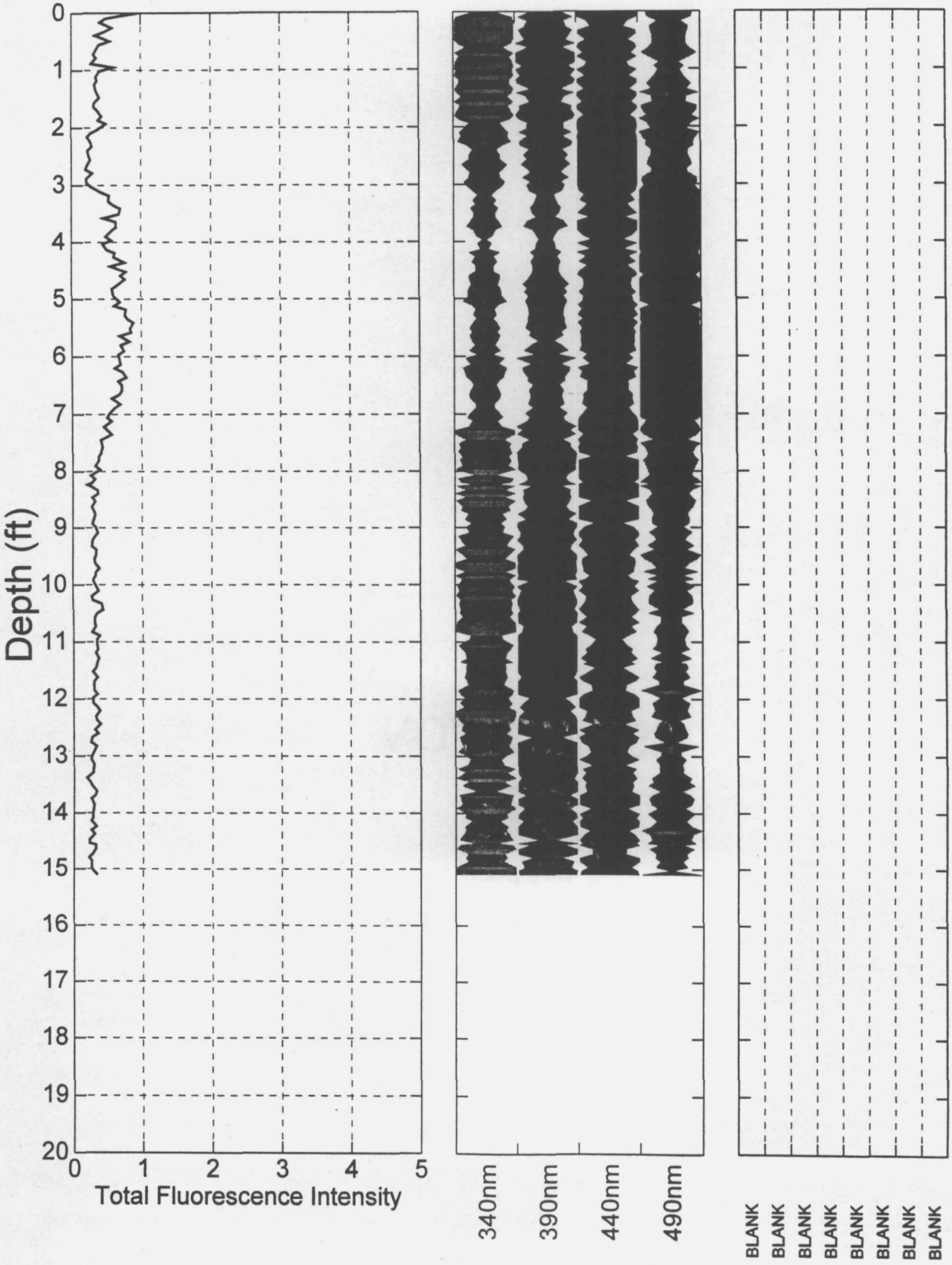


Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
0.8804%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT33

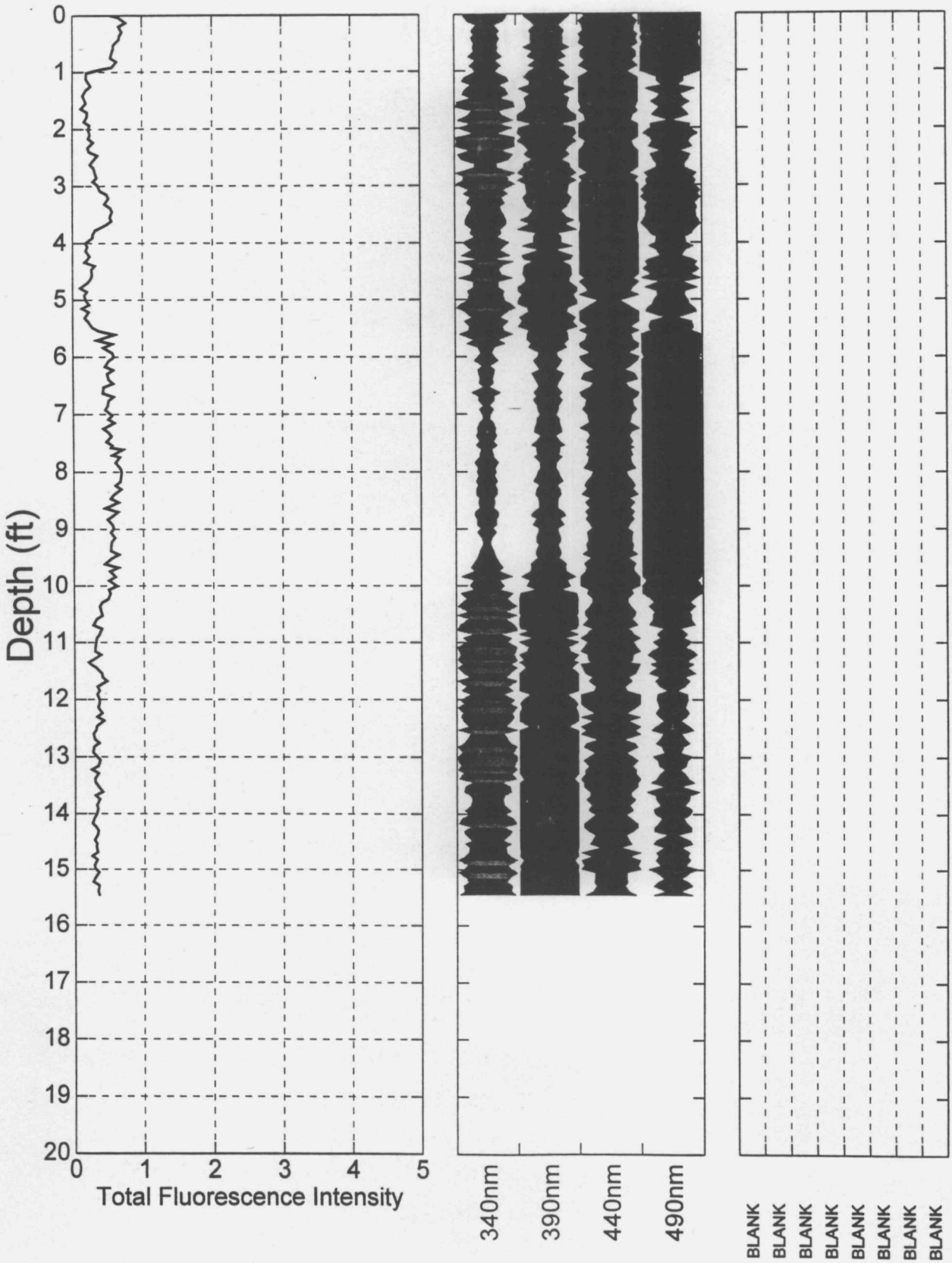


Measured LIF End Depth
15.45 ft
Measured Peak Fluorescence
0.7646%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT34

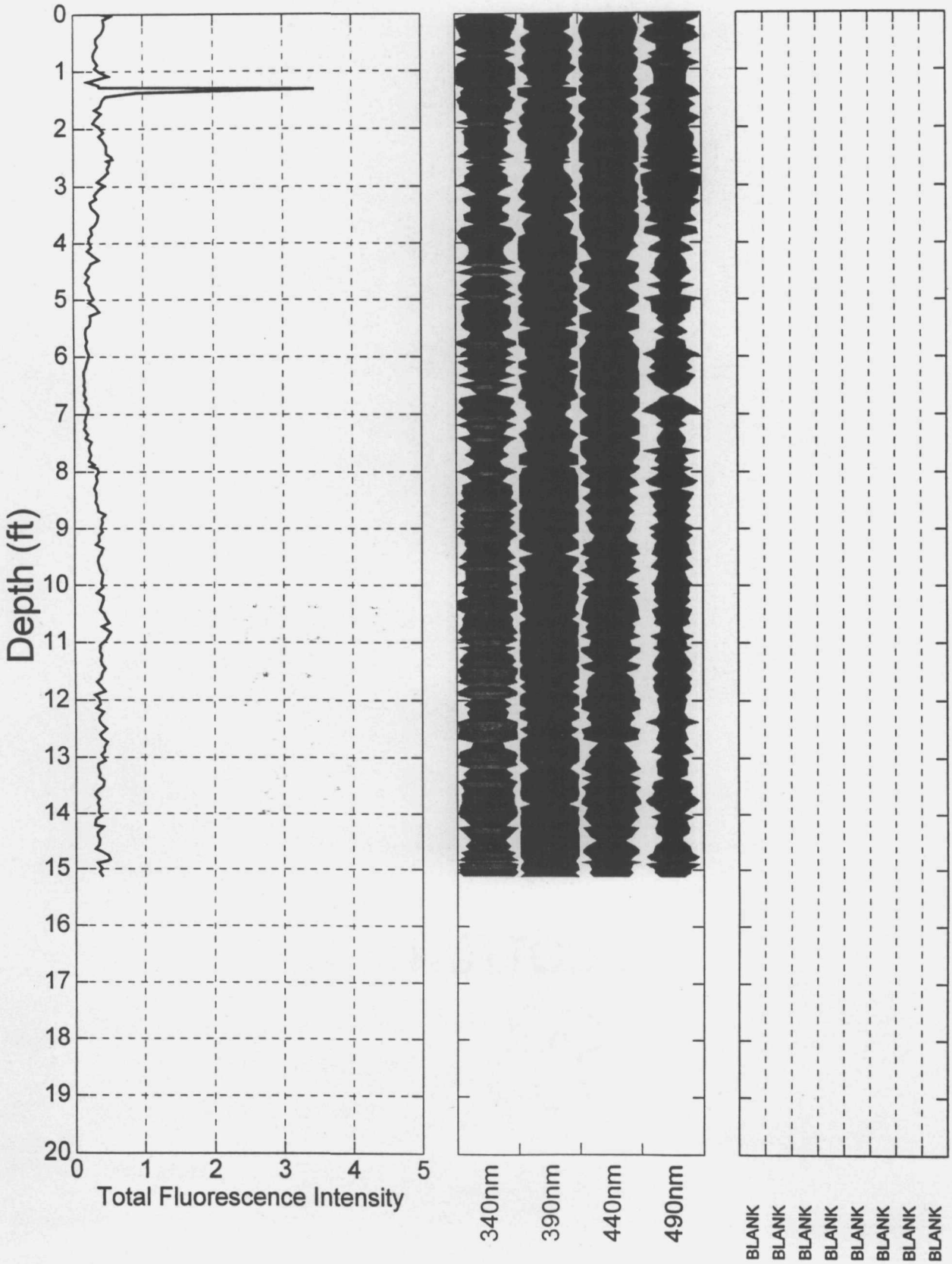


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
3.461%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT35

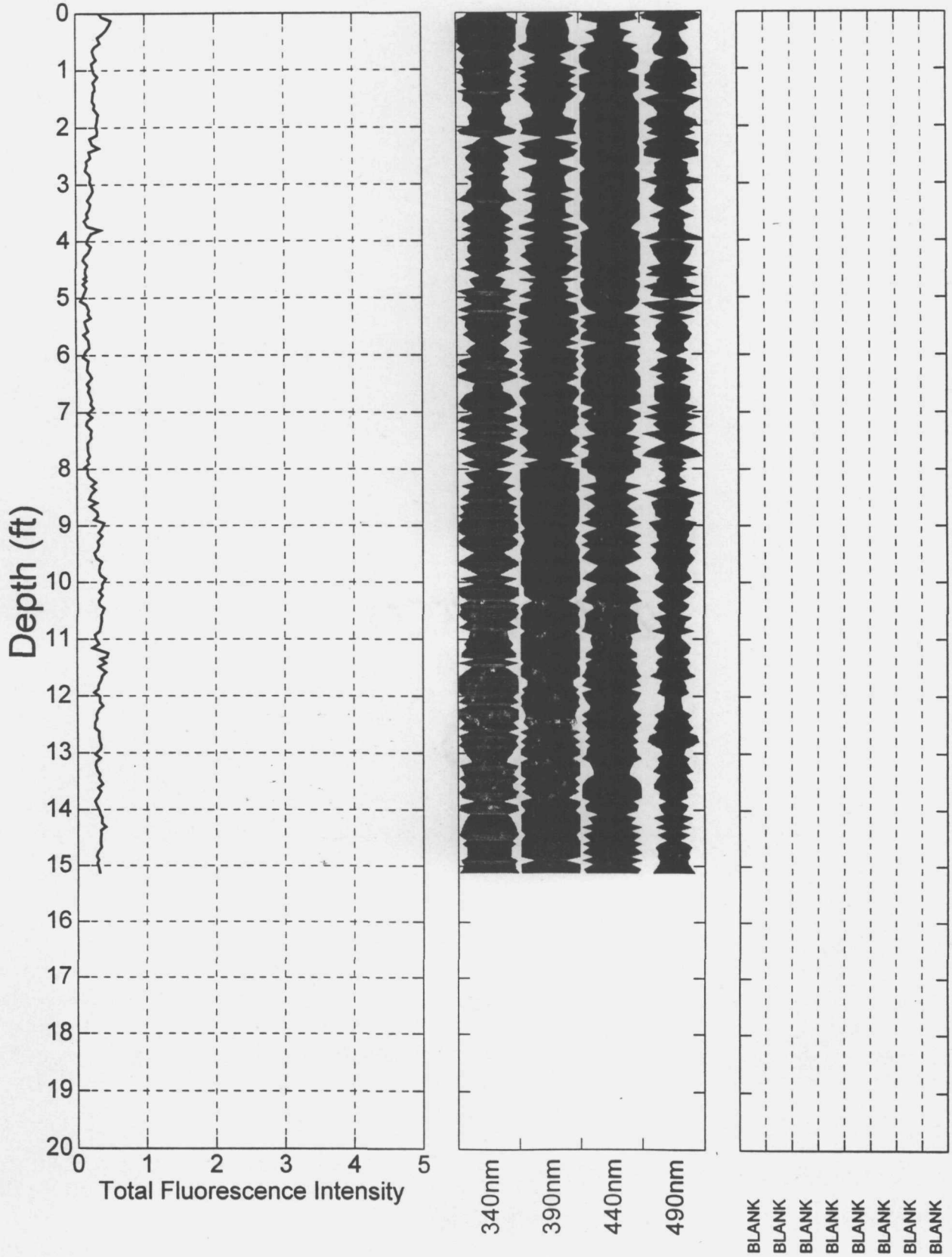


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
0.5148%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT36

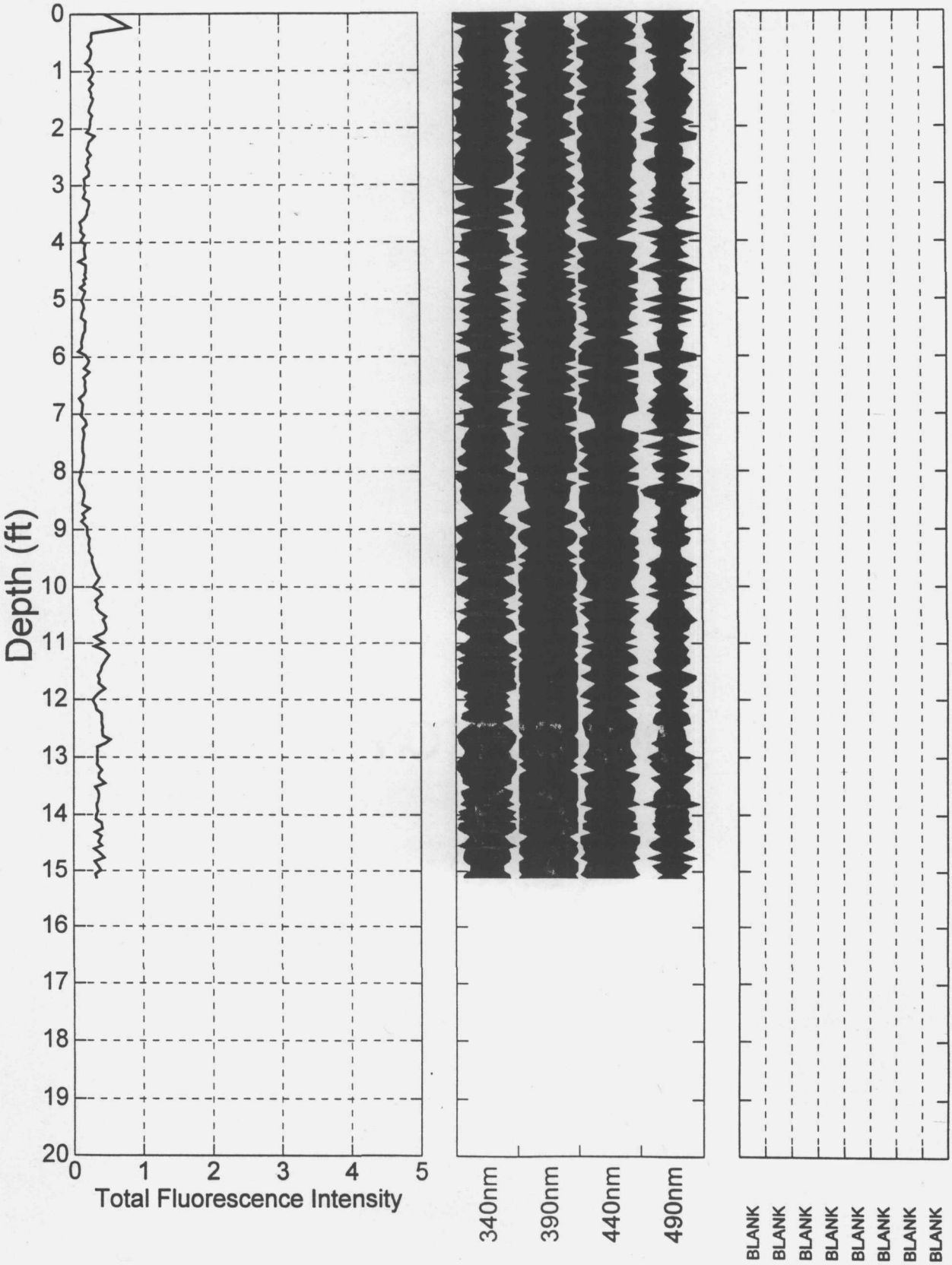


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
0.8505%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT37

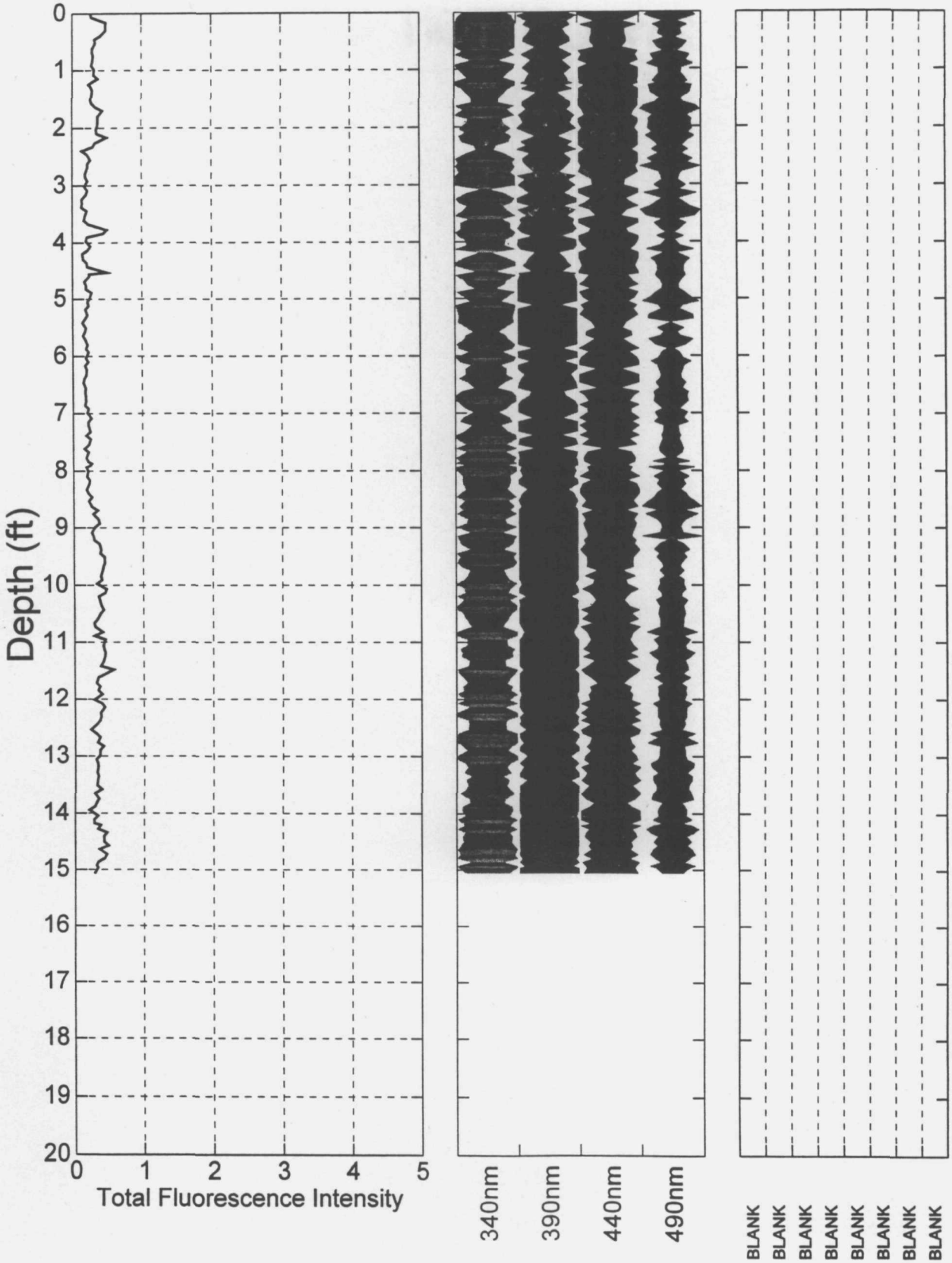


Measured LIF End Depth
15.06 ft
Measured Peak Fluorescence
0.5559%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT38

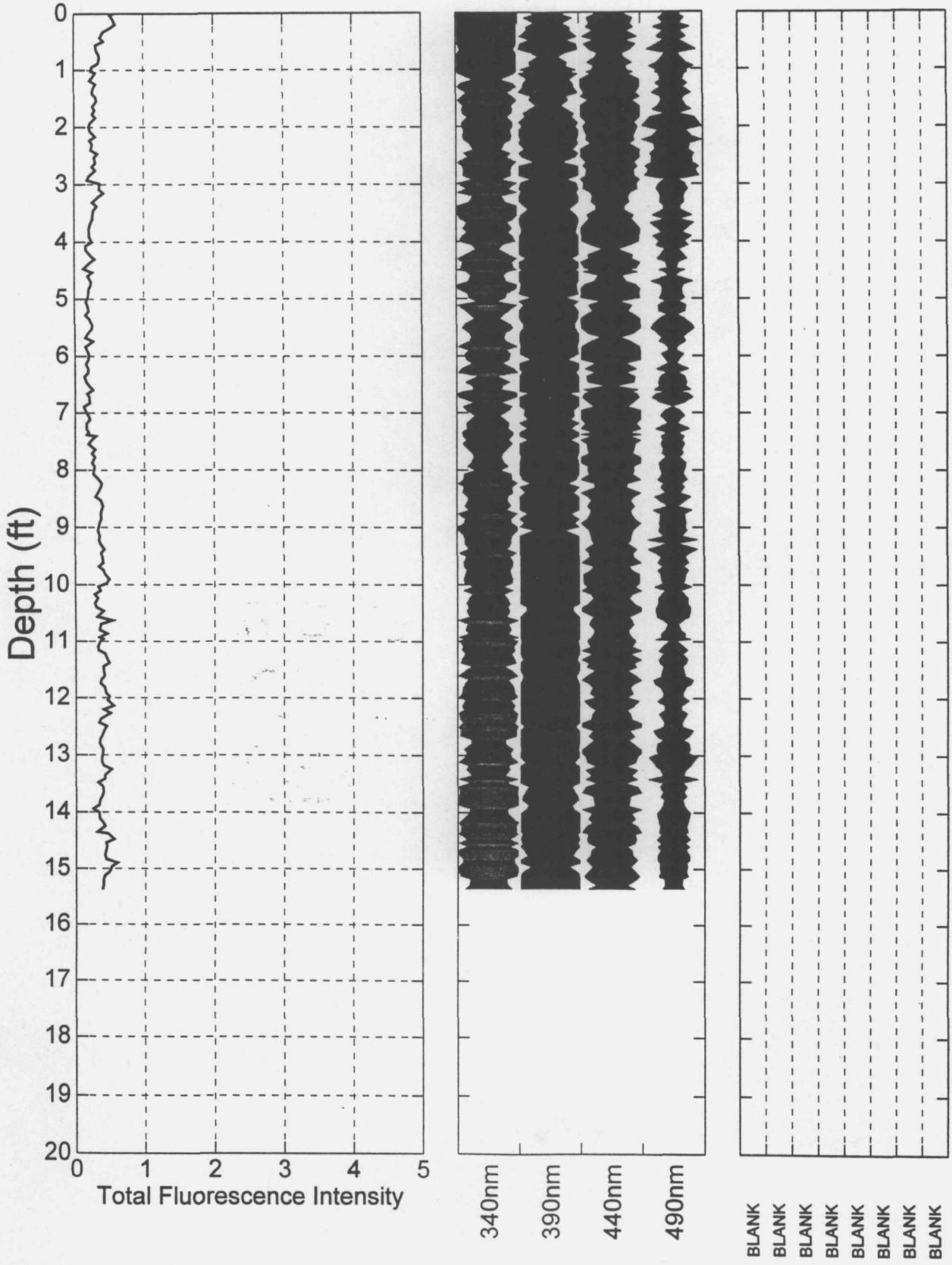


Measured LIF End Depth
15.35 ft
Measured Peak Fluorescence
0.5977%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT39

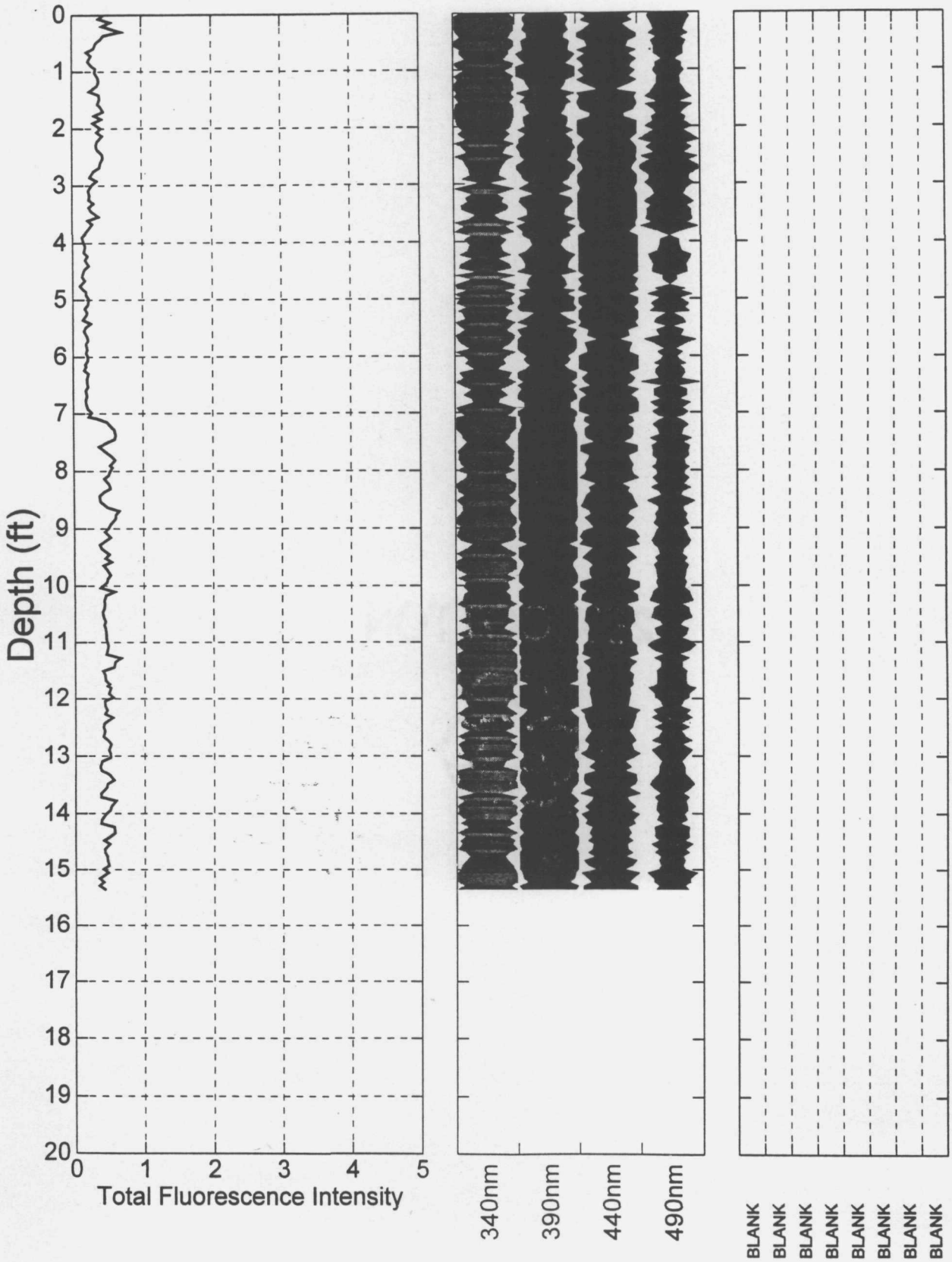


Measured LIF End Depth
15.35 ft
Measured Peak Fluorescence
0.7013%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT40

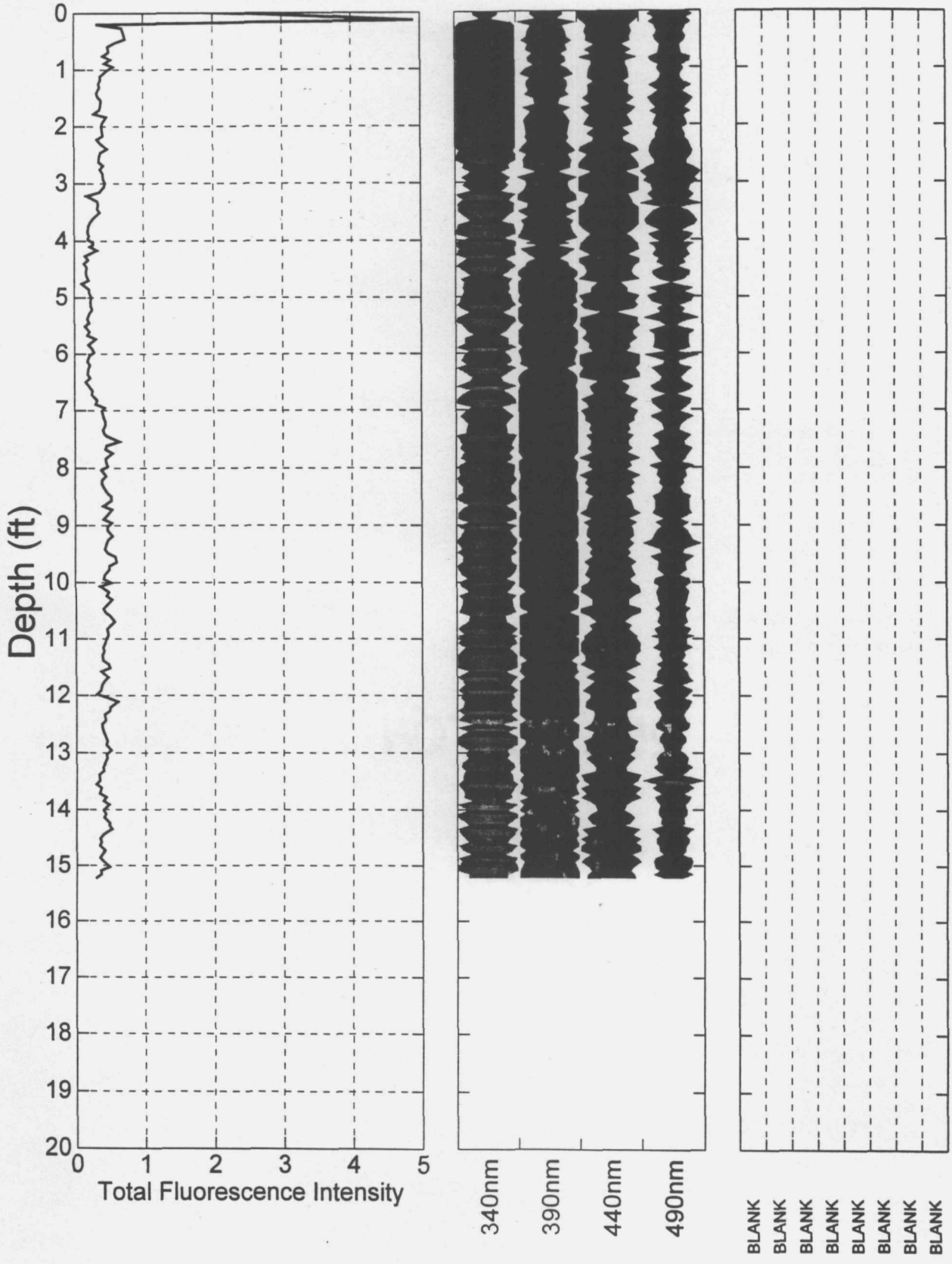


Measured LIF End Depth
15.22 ft
Measured Peak Fluorescence
4.905%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT41

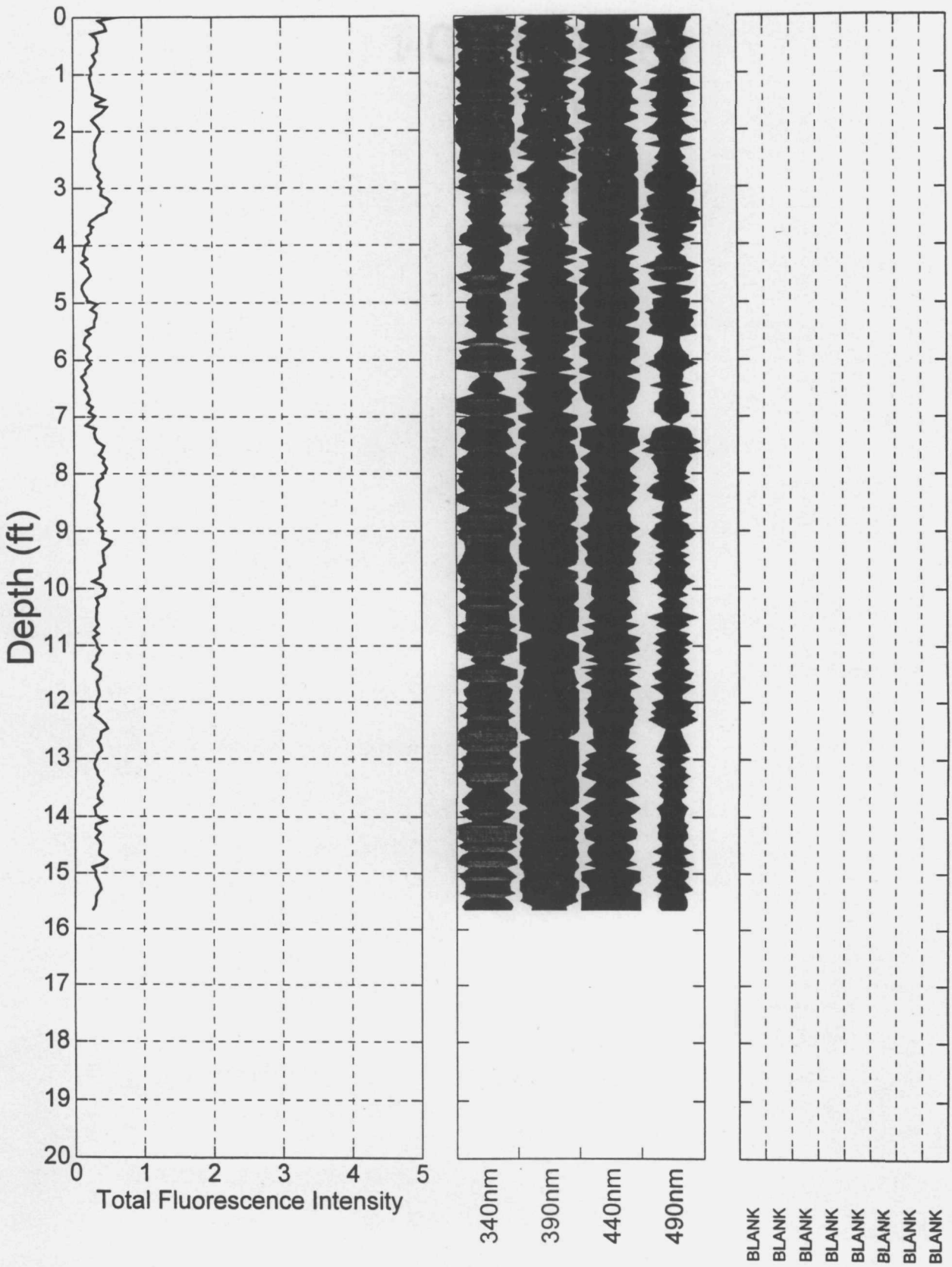


Measured LIF End Depth
15.65 ft
Measured Peak Fluorescence
0.5529%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT42

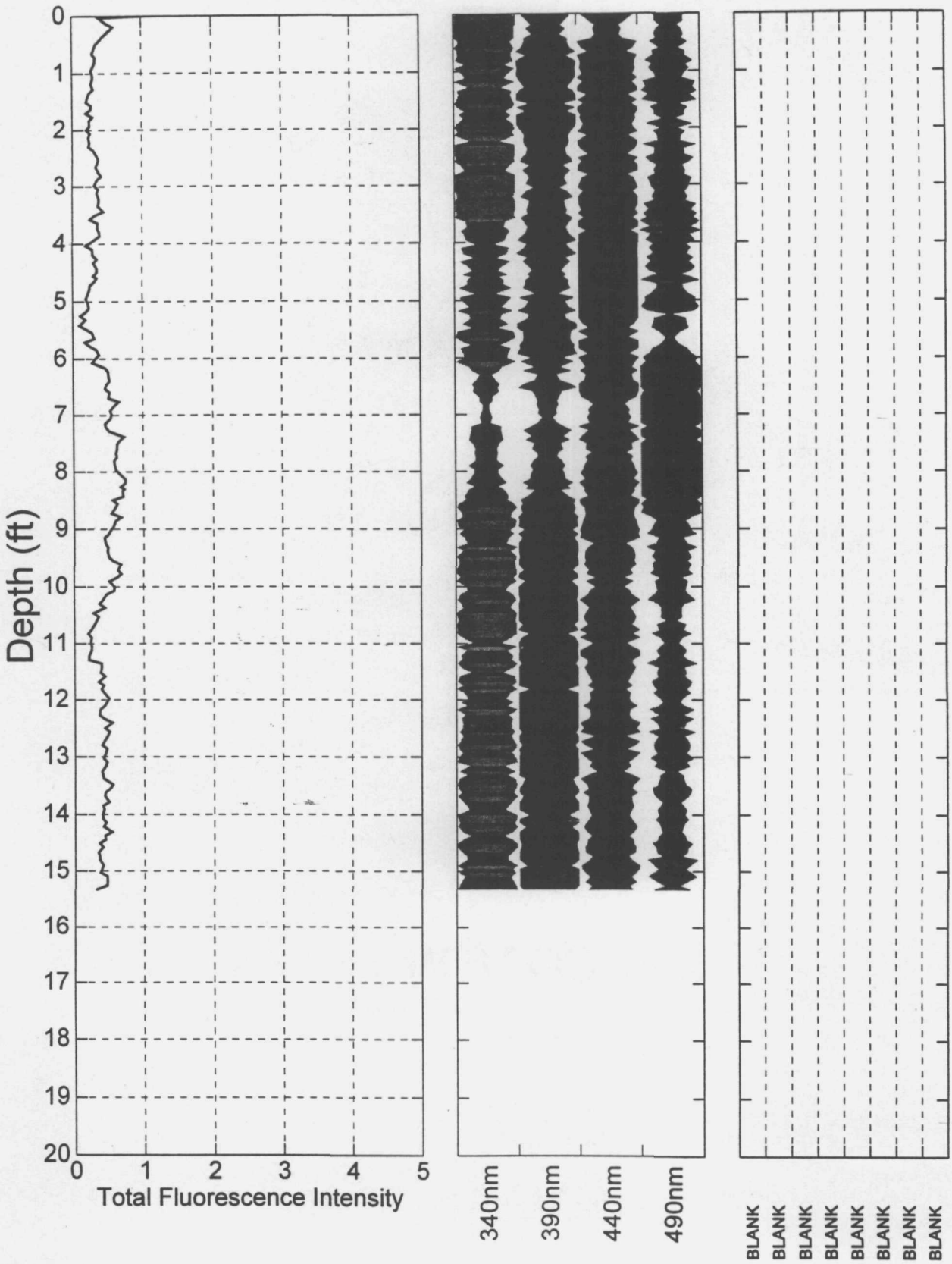


Measured LIF End Depth
15.32 ft
Measured Peak Fluorescence
0.7404%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT43

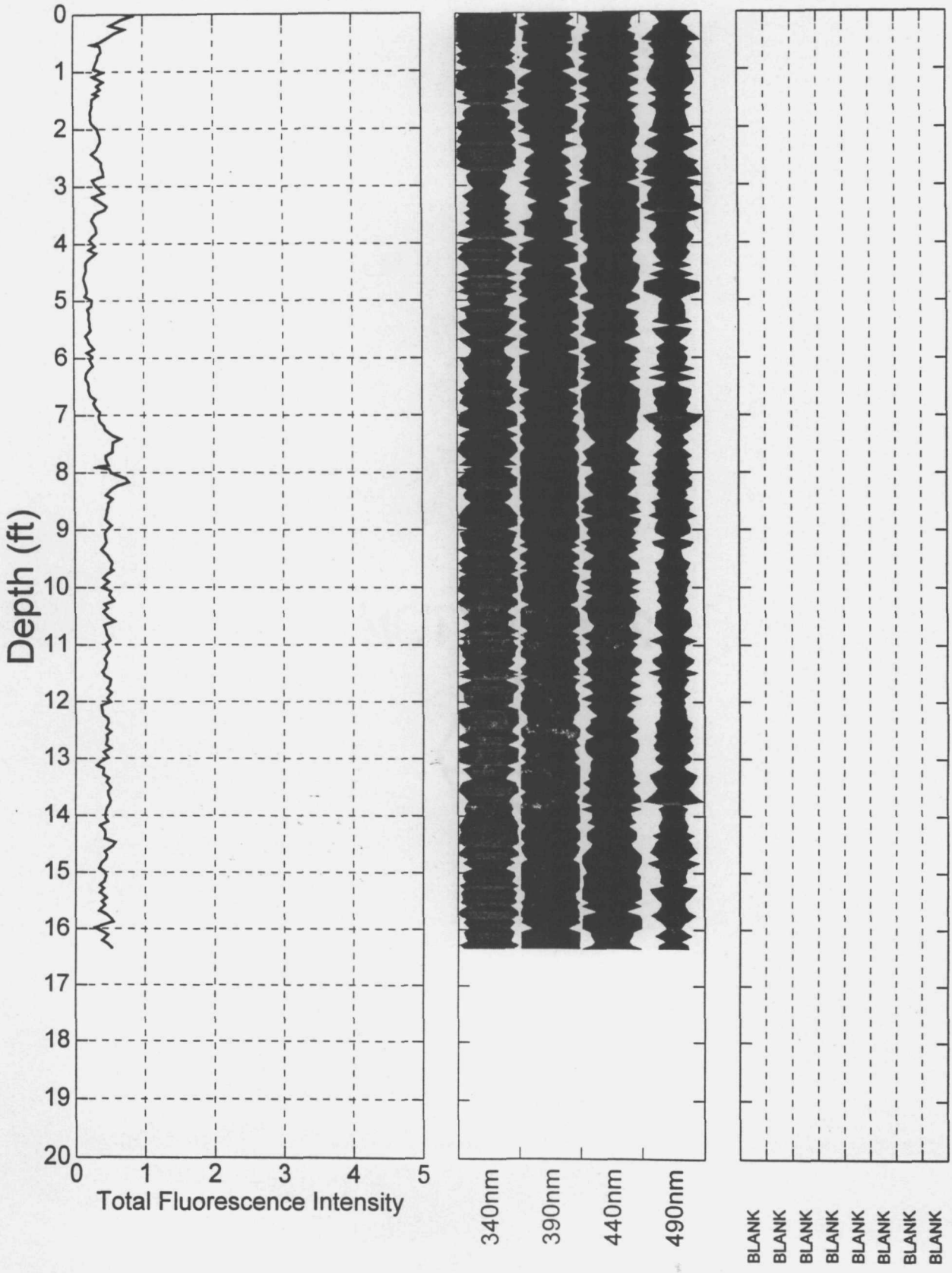


Measured LIF End Depth
16.34 ft
Measured Peak Fluorescence
0.8363%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT44

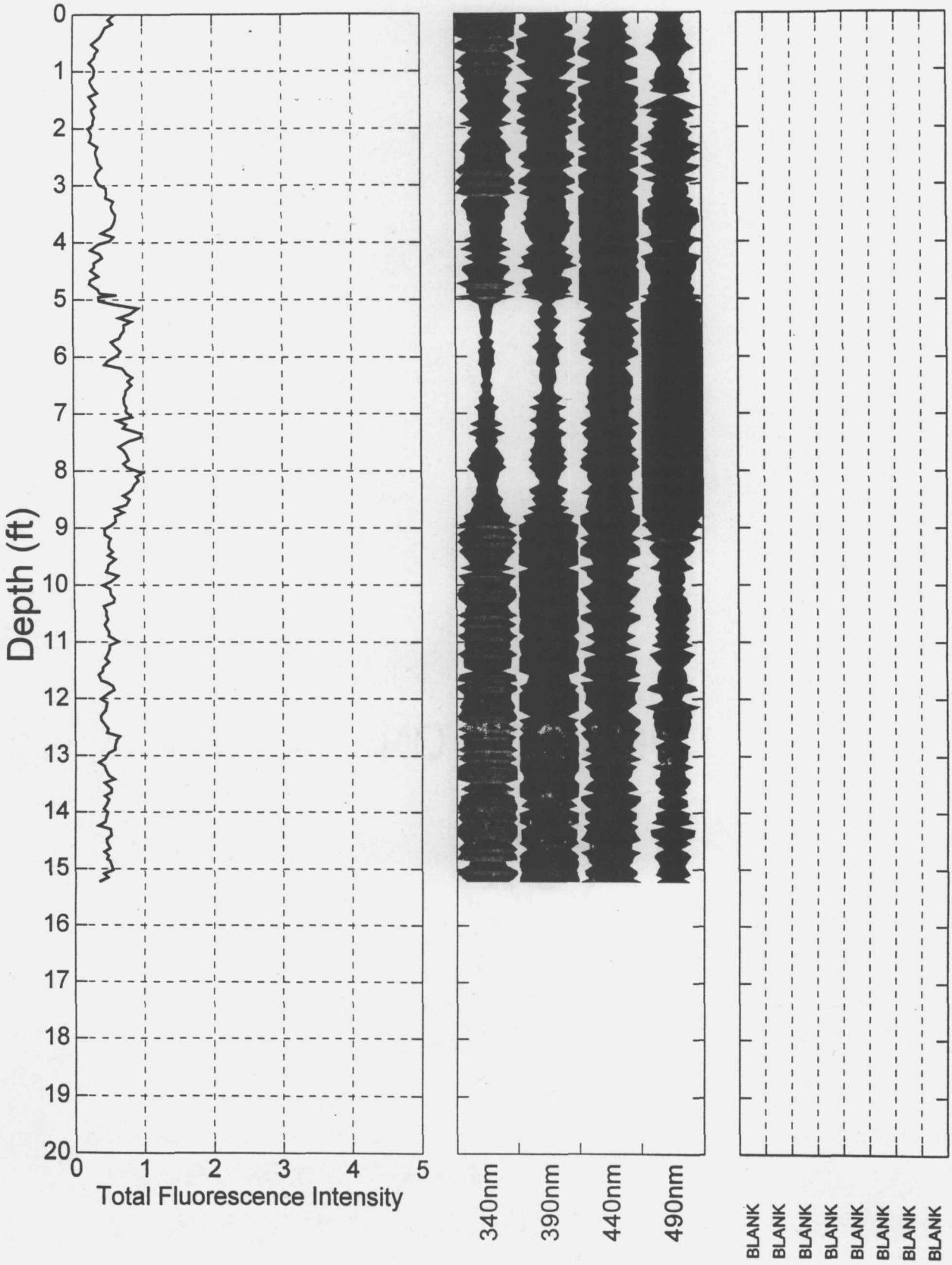


Measured LIF End Depth
15.22 ft
Measured Peak Fluorescence
0.9901%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT45

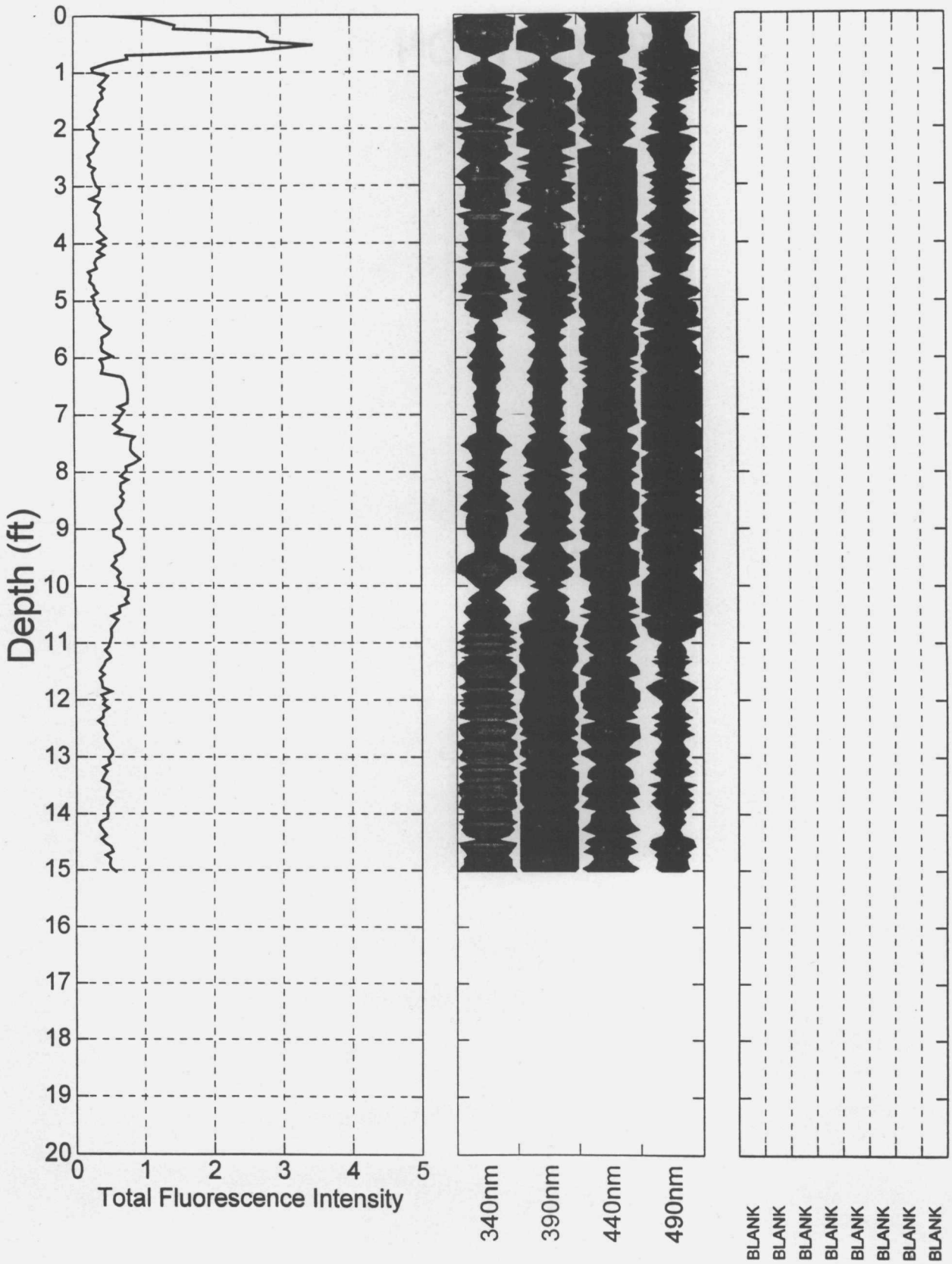


Measured LIF End Depth
15.03 ft
Measured Peak Fluorescence
3.469%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT46

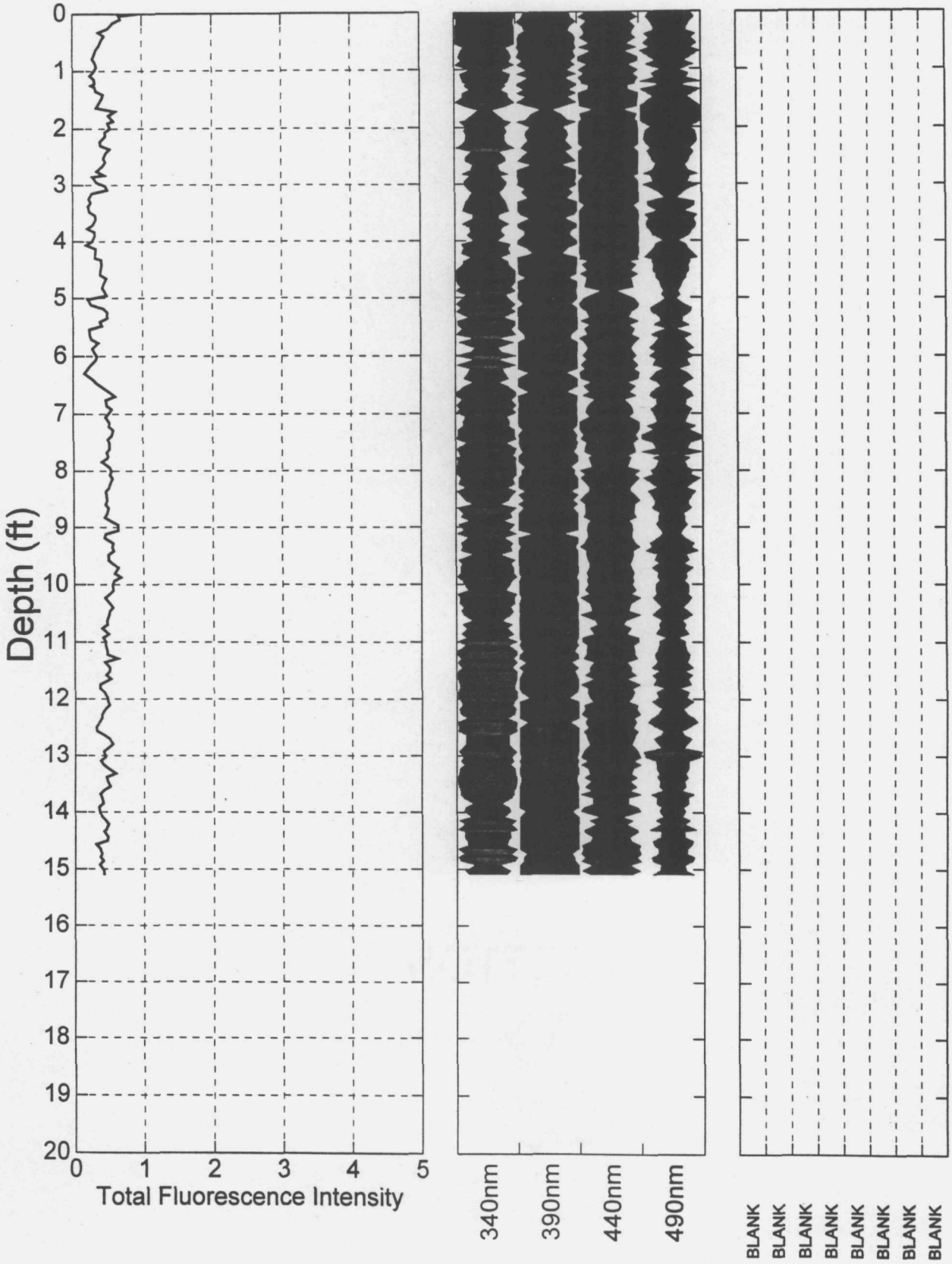


Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
0.6934%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT47

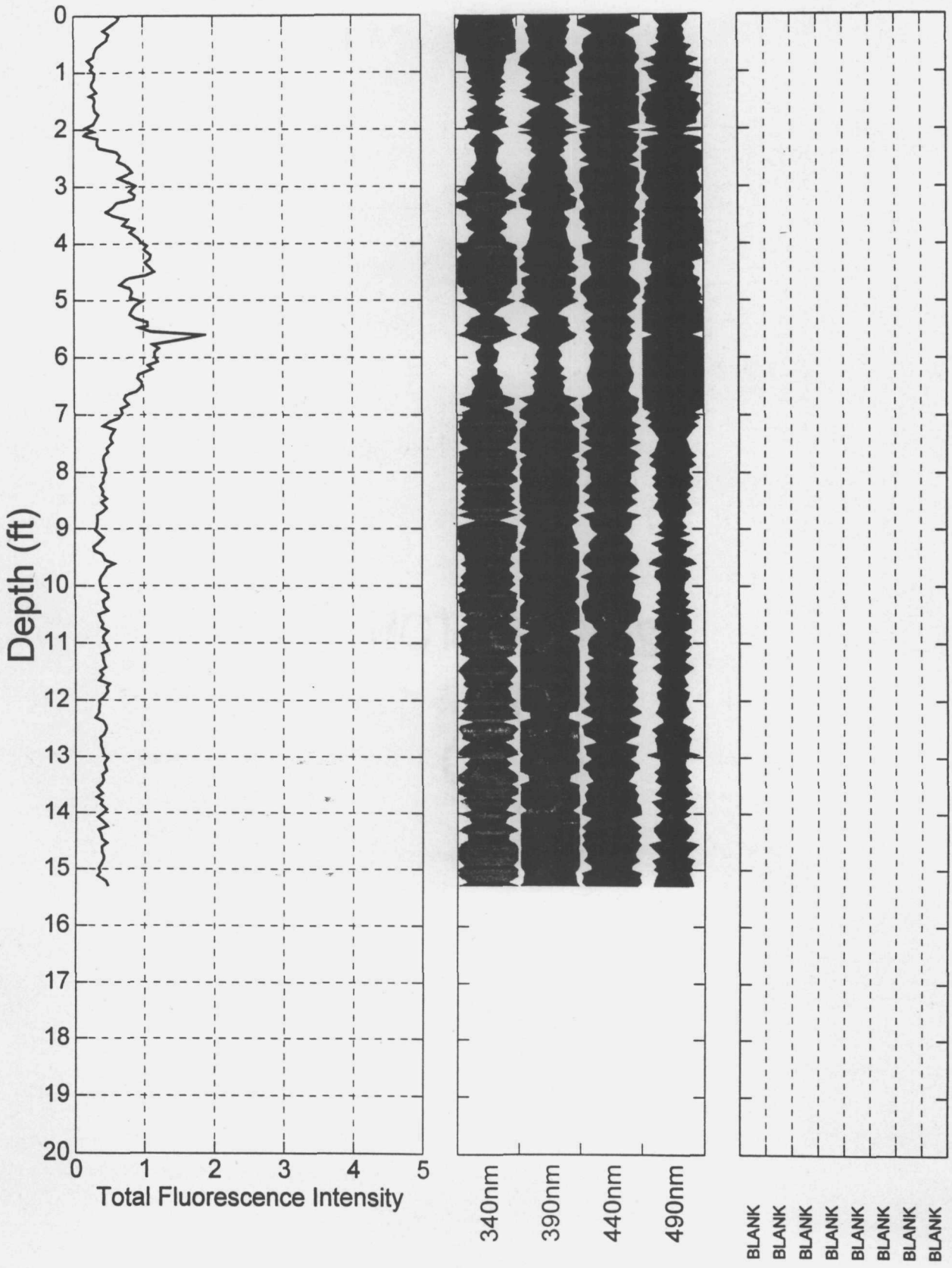


Measured LIF End Depth
15.29 ft
Measured Peak Fluorescence
1.857%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT48

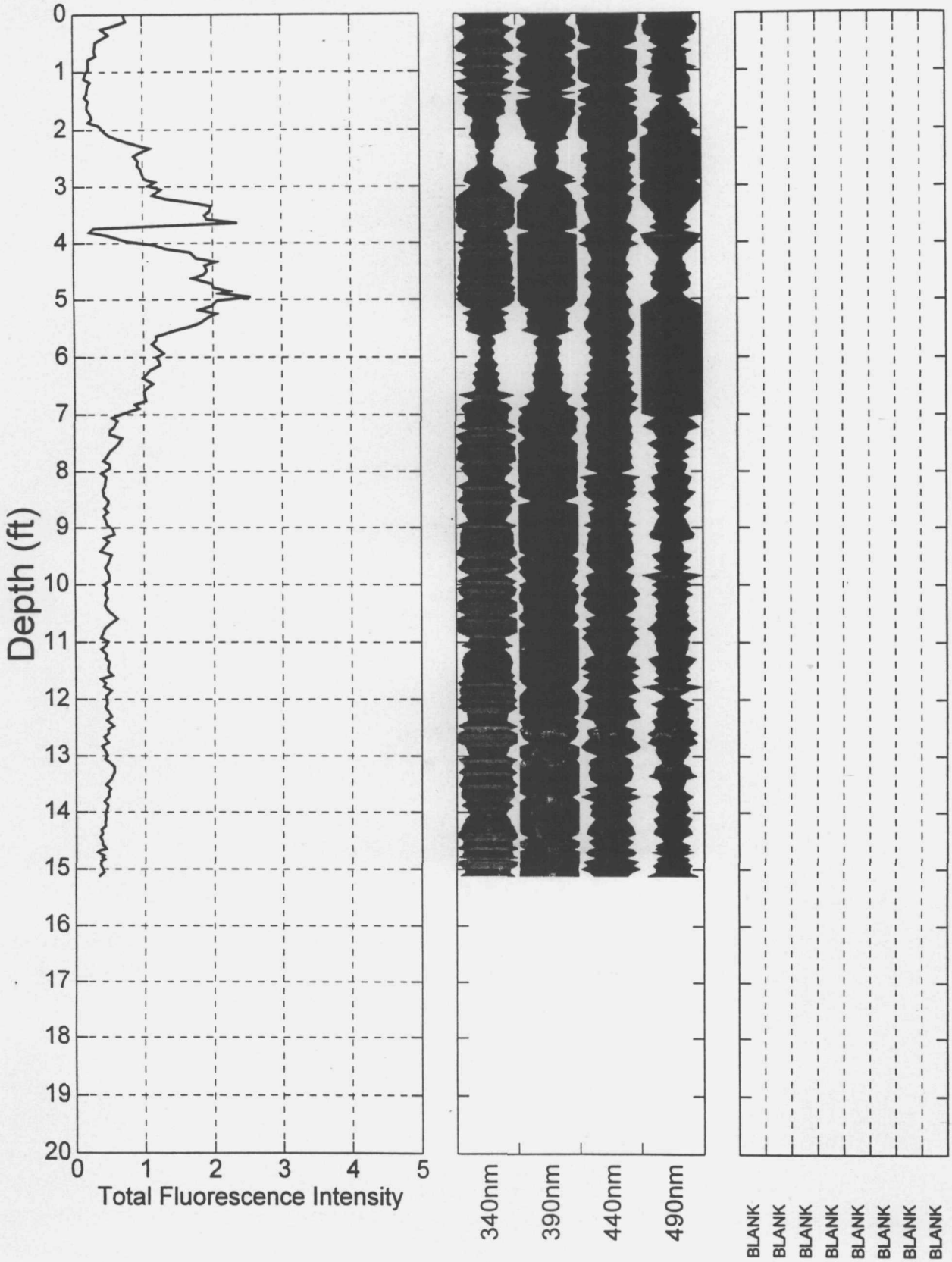


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
2.518%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT49

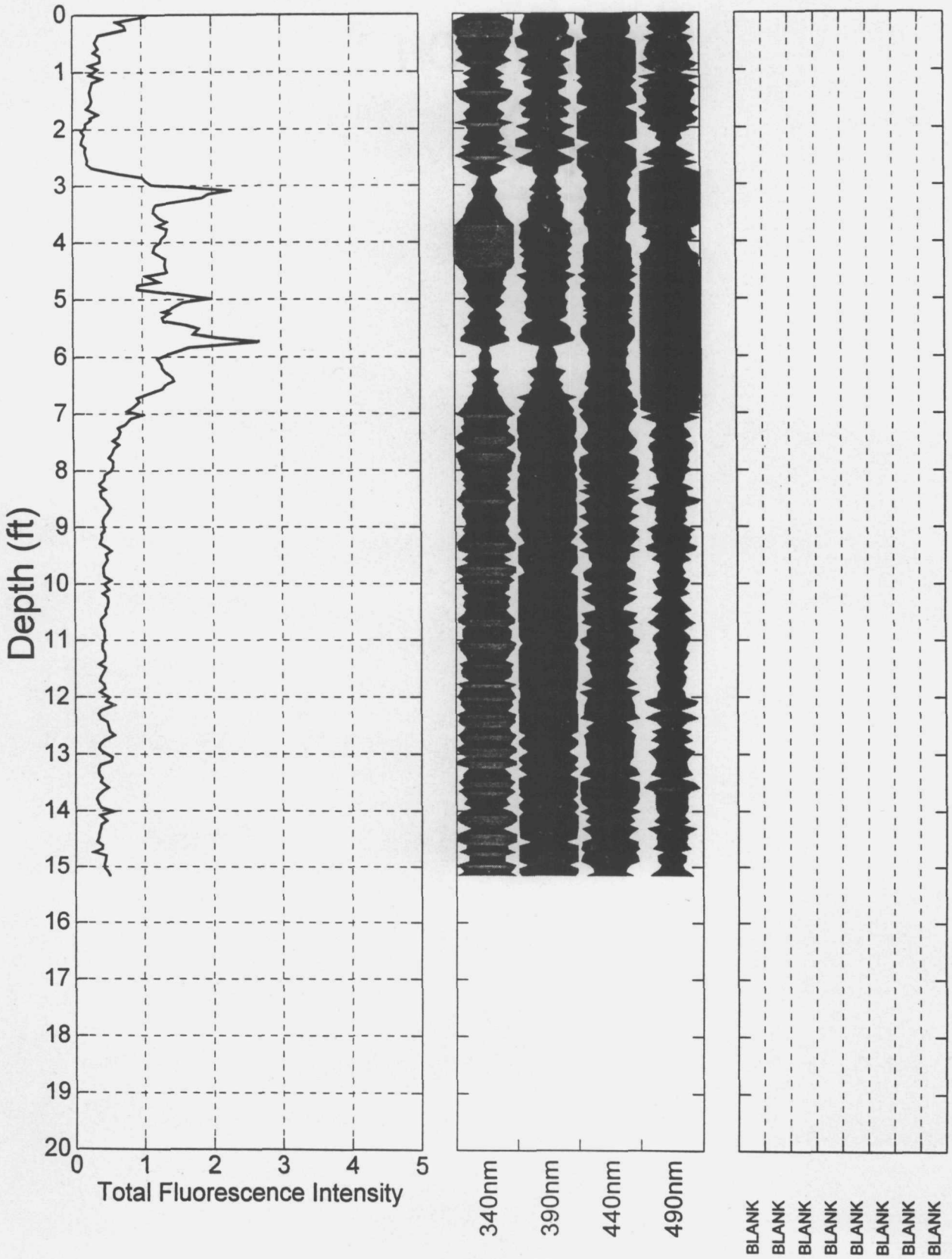


Measured LIF End Depth
15.16 ft
Measured Peak Fluorescence
2.684%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT50

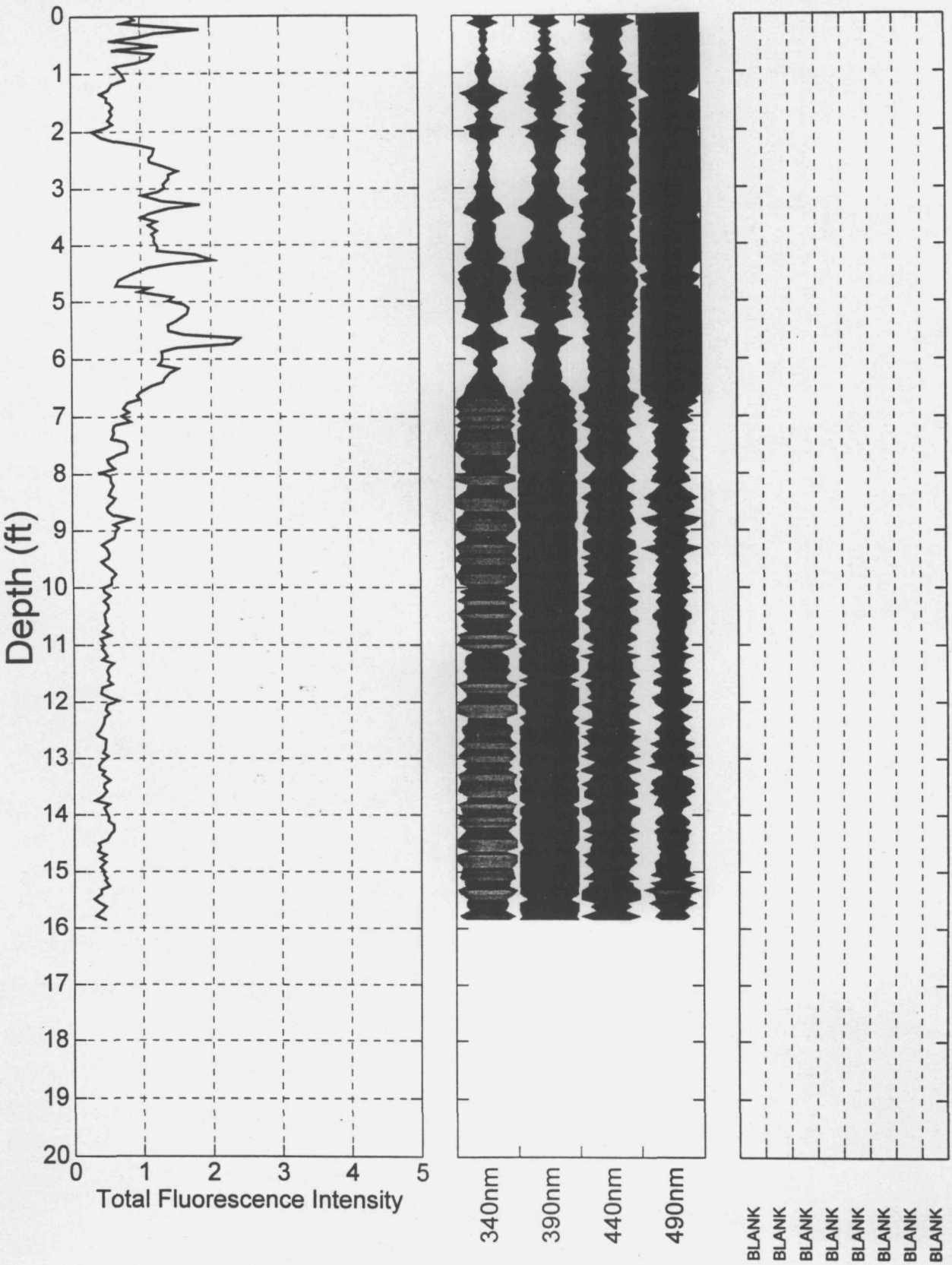


Measured LIF End Depth
15.85 ft
Measured Peak Fluorescence
2.408%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT51

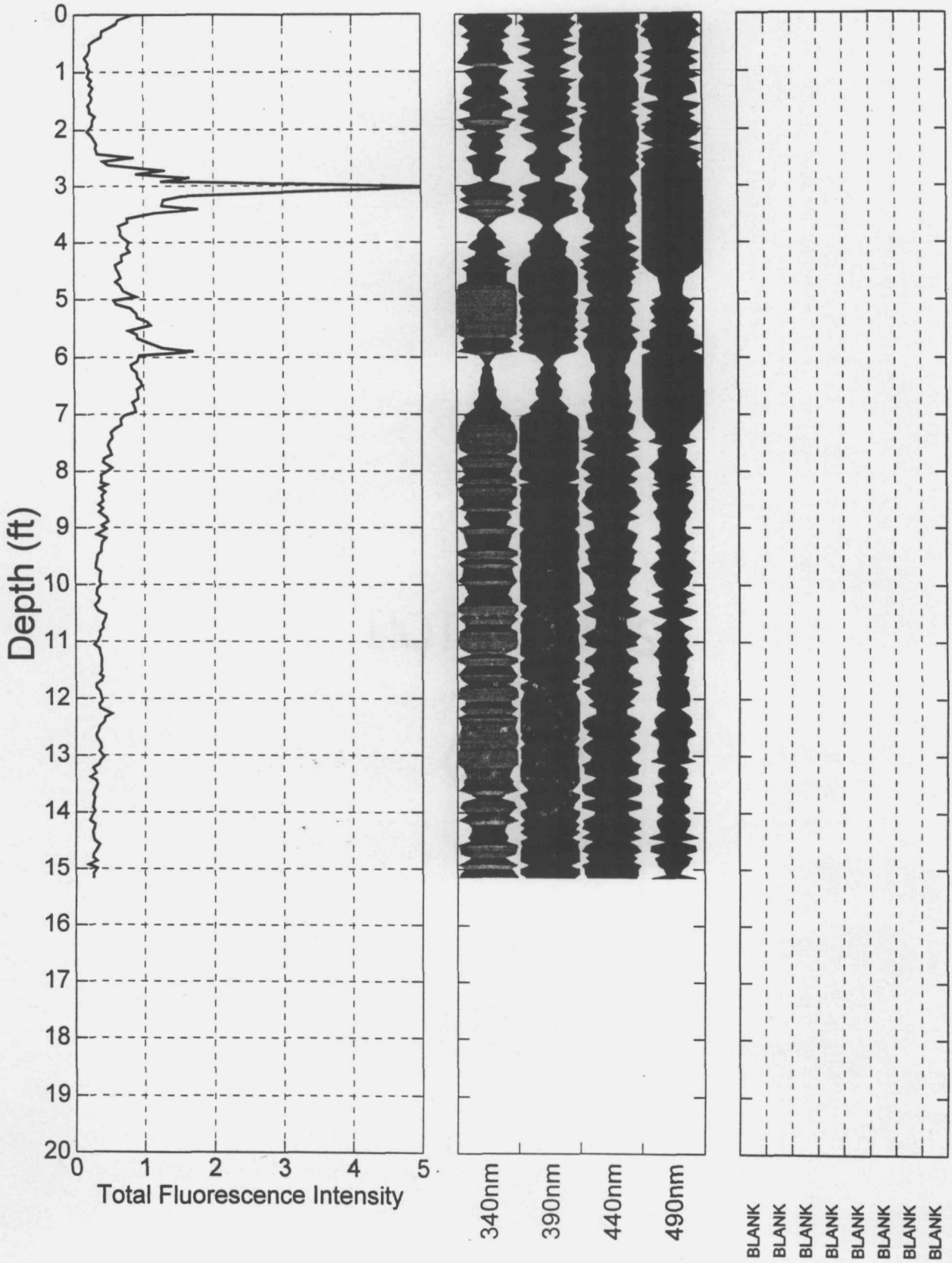


Measured LIF End Depth
15.16 ft
Measured Peak Fluorescence
5.411%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT52

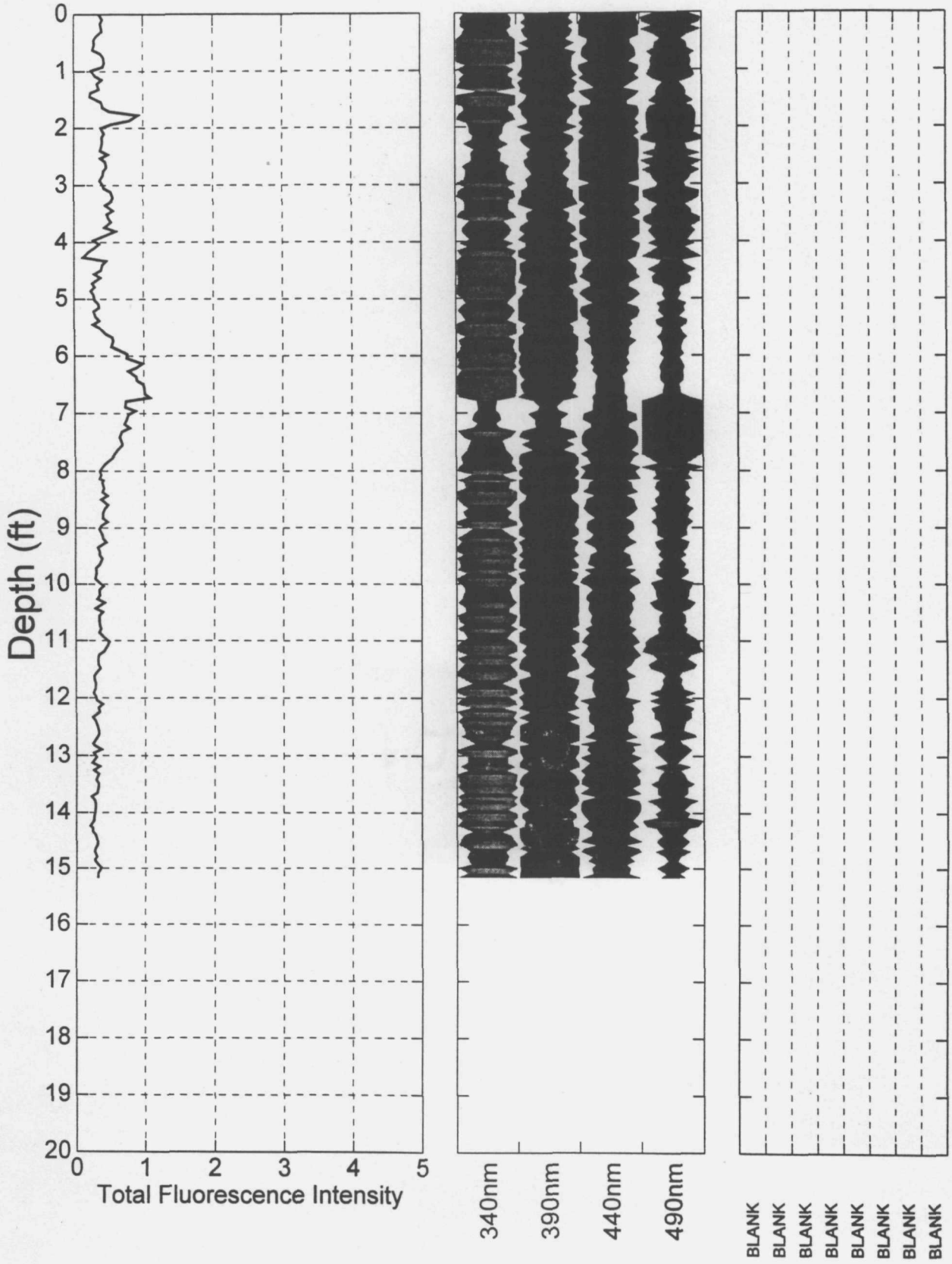


Measured LIF End Depth
15.16 ft
Measured Peak Fluorescence
1.082%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT53

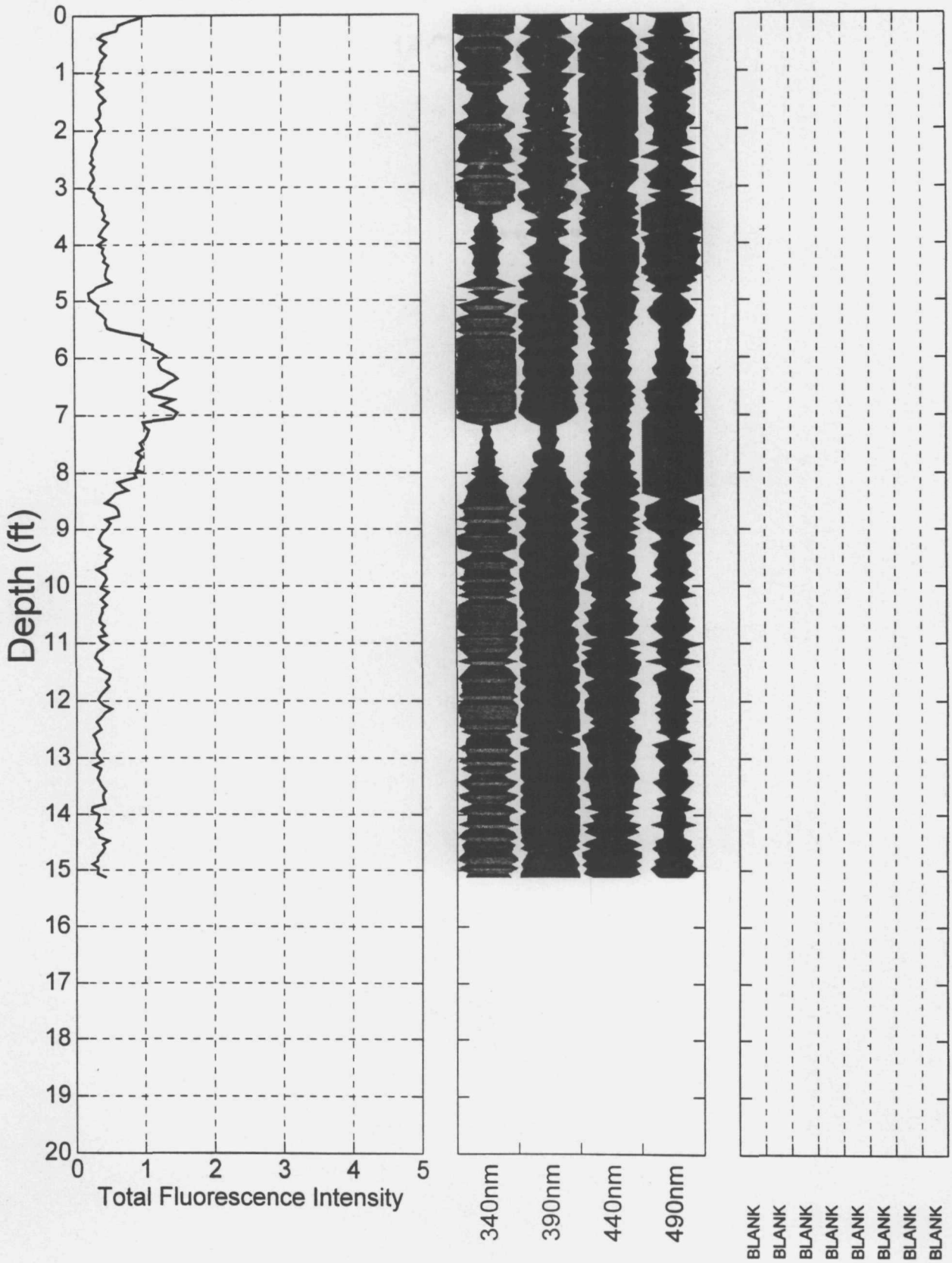


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
1.479%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT54

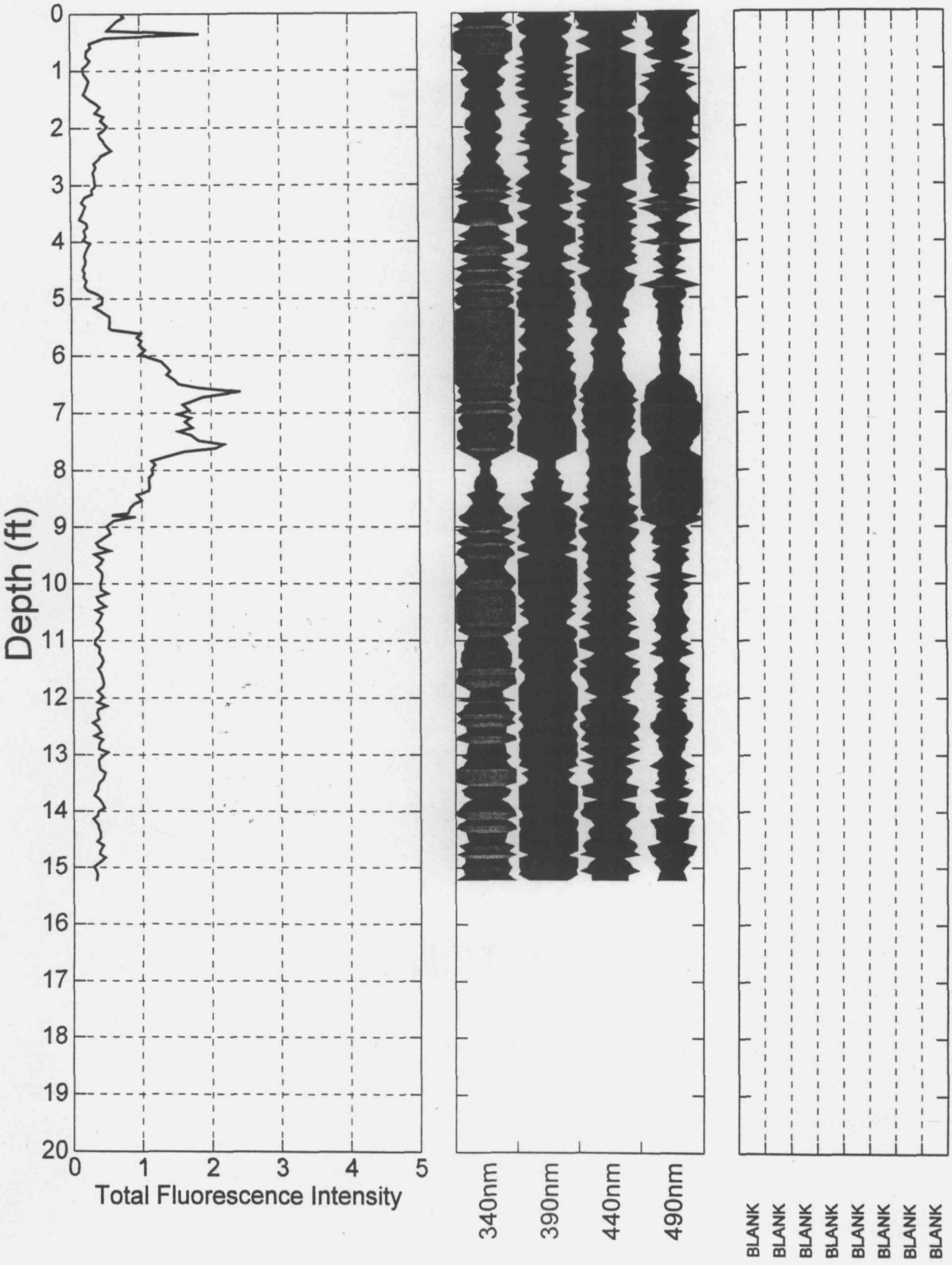


Measured LIF End Depth
15.22 ft
Measured Peak Fluorescence
2.407%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT55

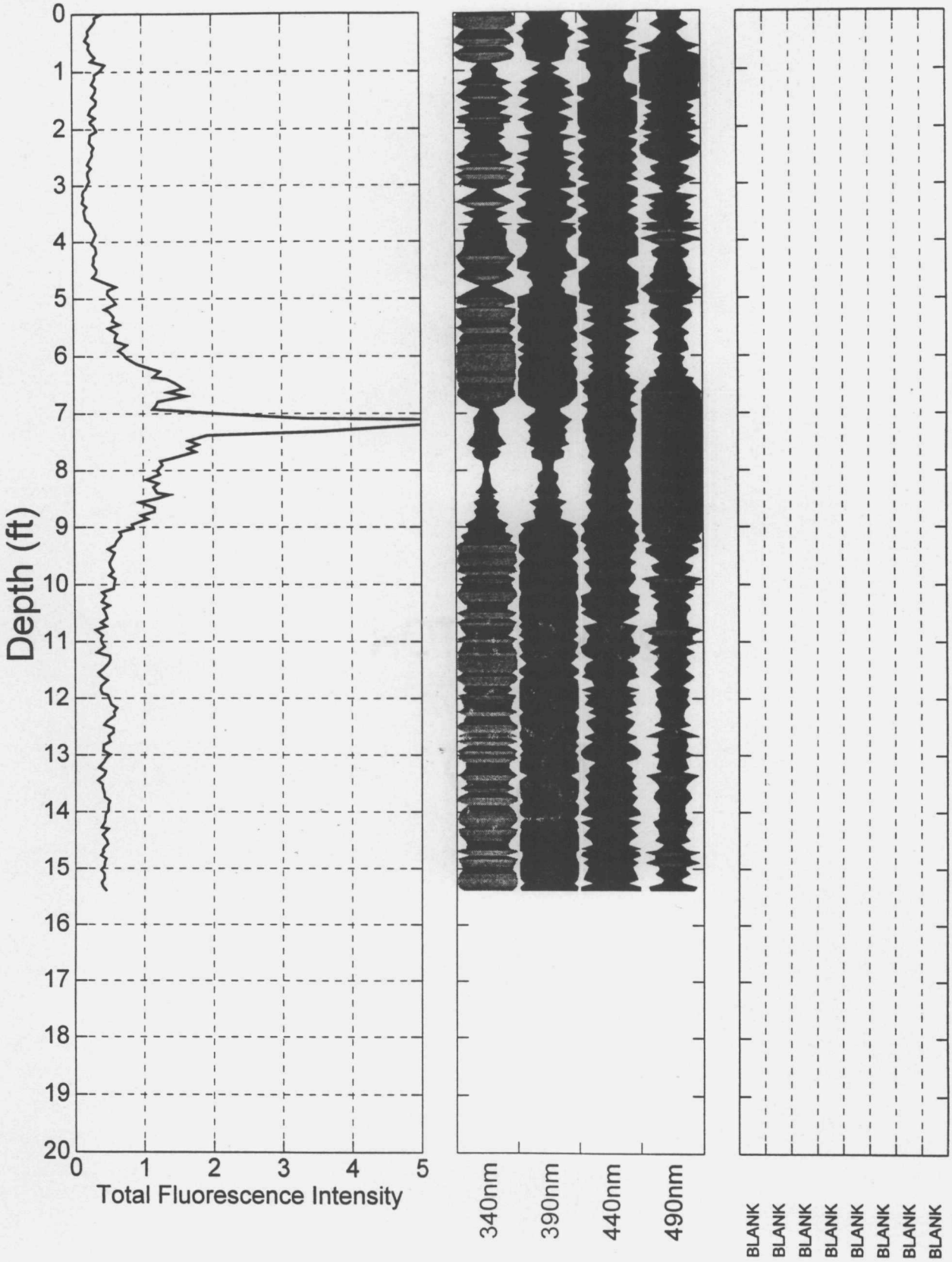


Measured LIF End Depth
15.39 ft
Measured Peak Fluorescence
5.951%

Job#: 0301-8077

Acquisition Date: 04-29-1998

CPT56

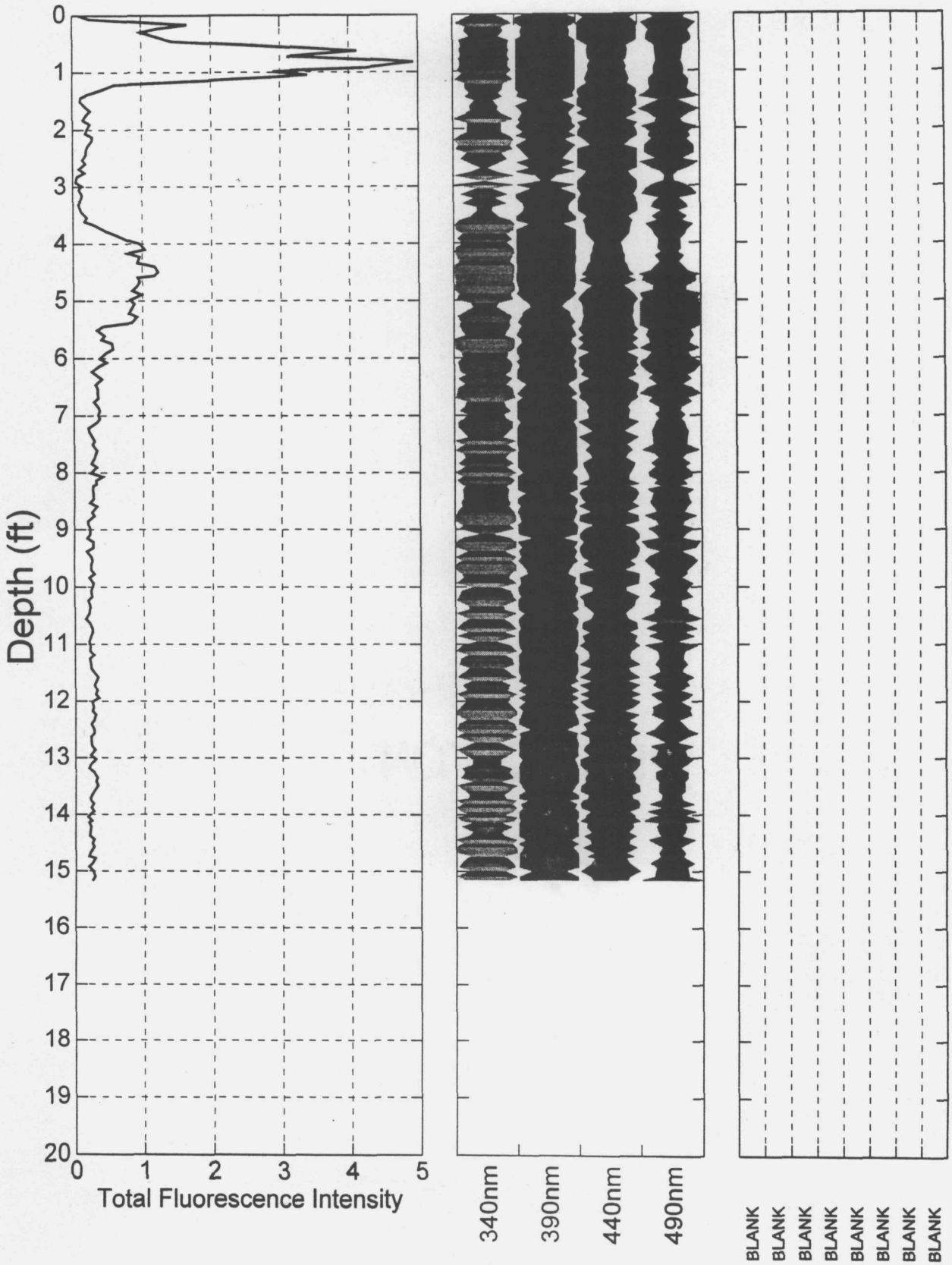


Measured LIF End Depth
15.16 ft
Measured Peak Fluorescence
4.929%

Job#: 0301-8077

Acquisition Date: 04-30-1998

CPT57

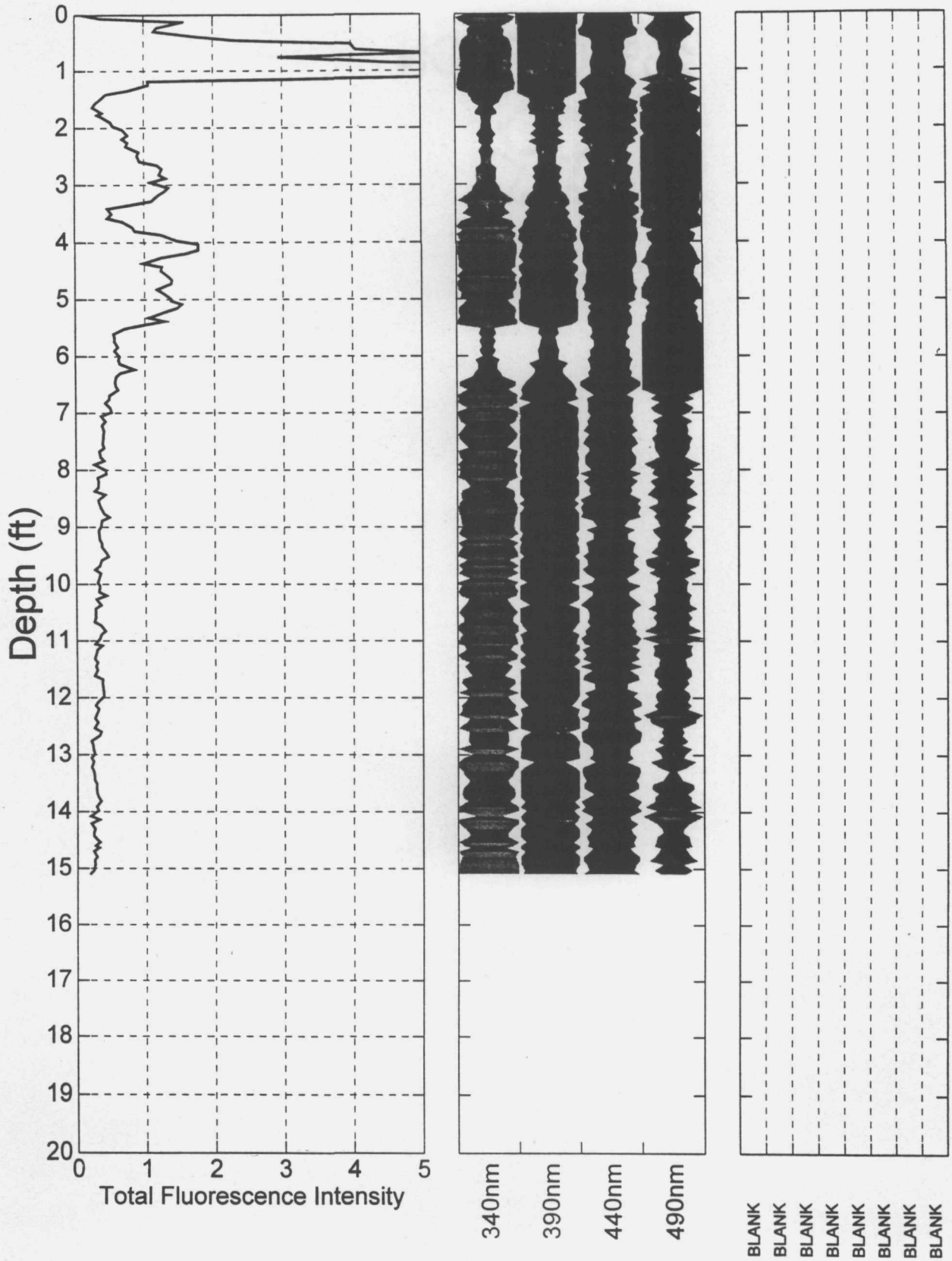


Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
8.187%

Job#: 0301-8077

Acquisition Date: 04-30-1998

CPT58

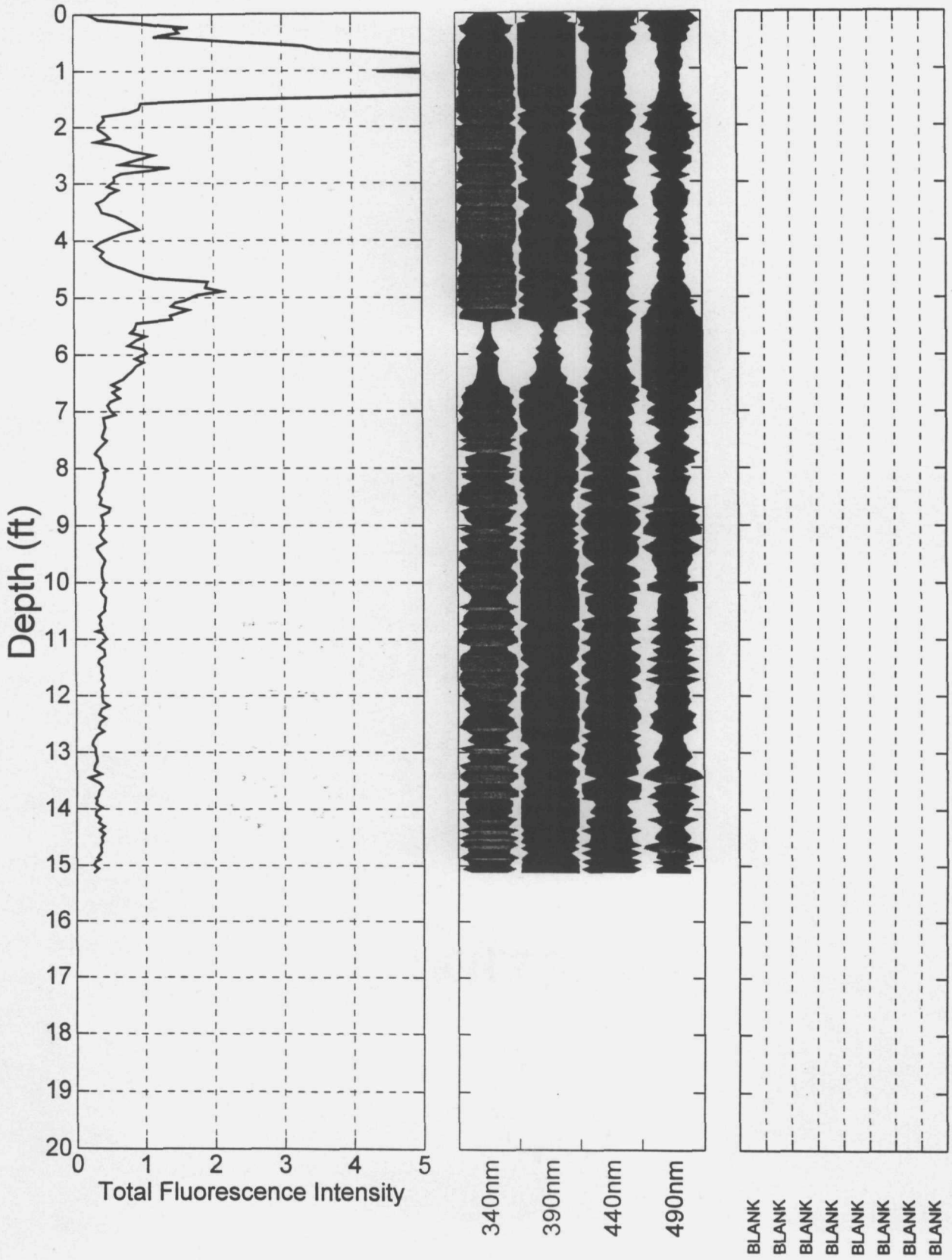


Measured LIF End Depth
15.12 ft
Measured Peak Fluorescence
7.199%

Job#: 0301-8077

Acquisition Date: 04-30-1998

CPT59

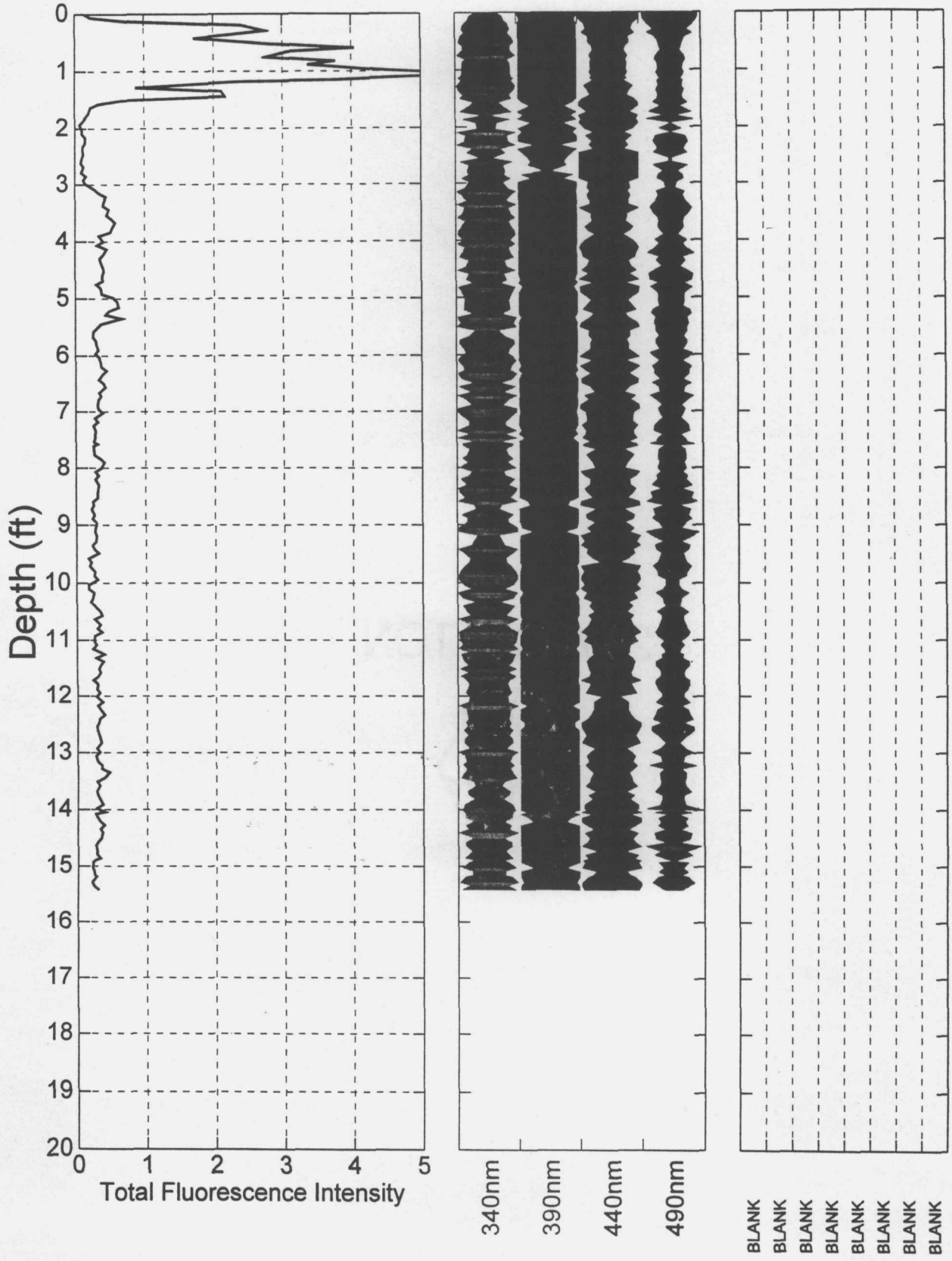


Measured LIF End Depth
15.42 ft
Measured Peak Fluorescence
5.852%

Job#: 0301-8077

Acquisition Date: 04-30-1998

CPT60

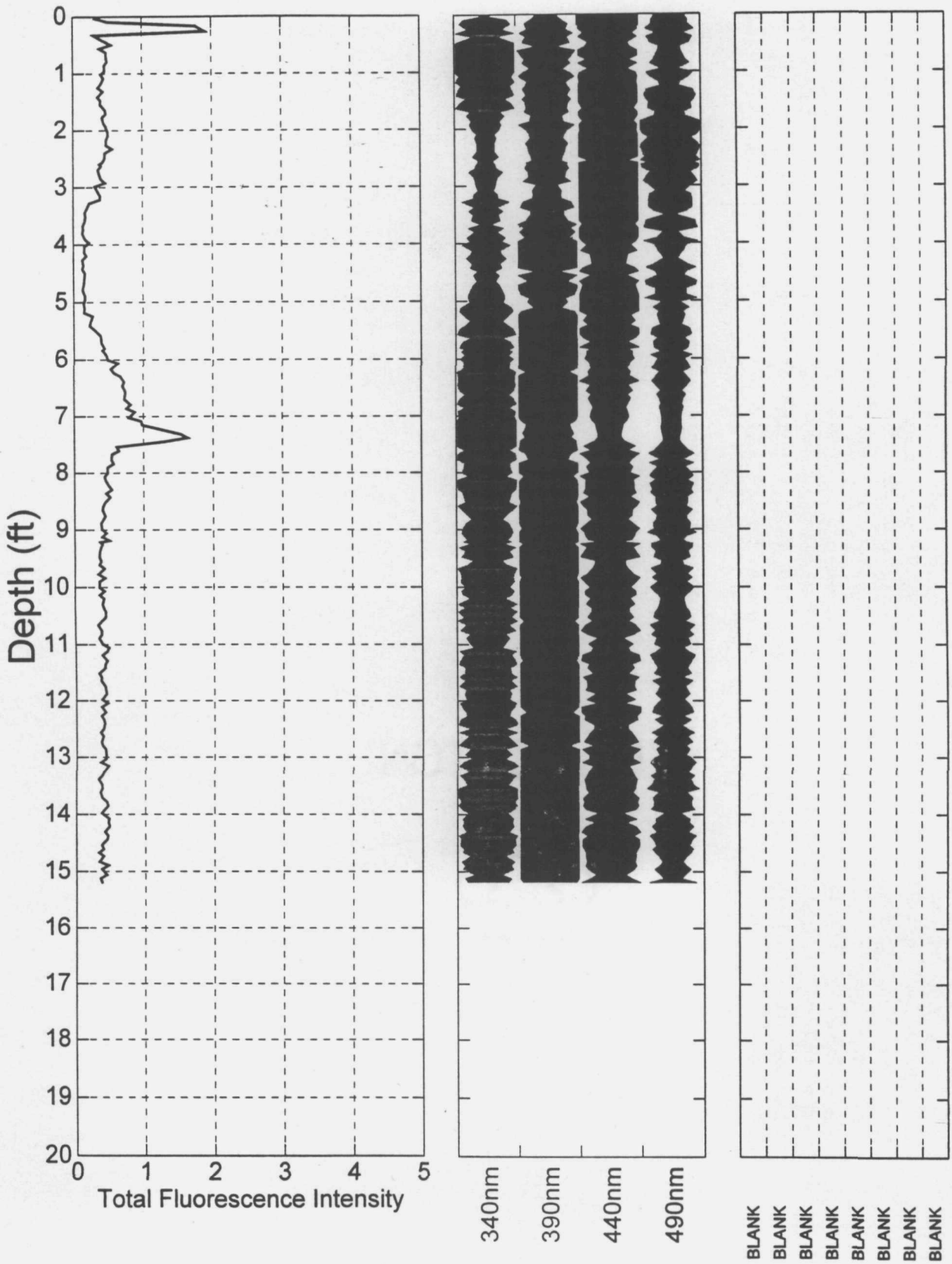


Measured LIF End Depth
15.19 ft
Measured Peak Fluorescence
1.906%

Job#: 0301-8077

Acquisition Date: 04-30-1998

CPT61

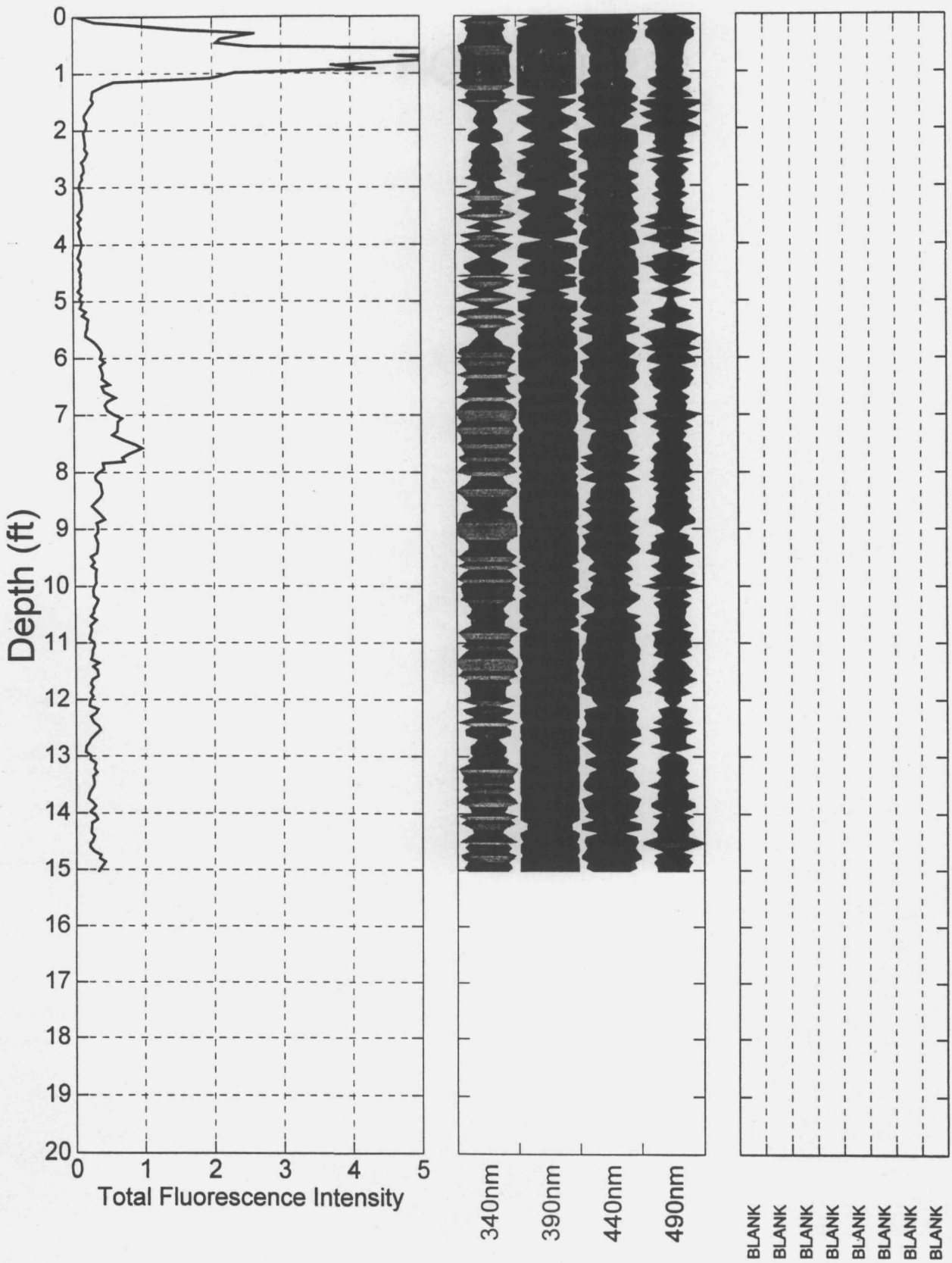


Measured LIF End Depth
15.03 ft
Measured Peak Fluorescence
9.029%

Job#: 0301-8077

Acquisition Date: 04-30-1998

CPT62

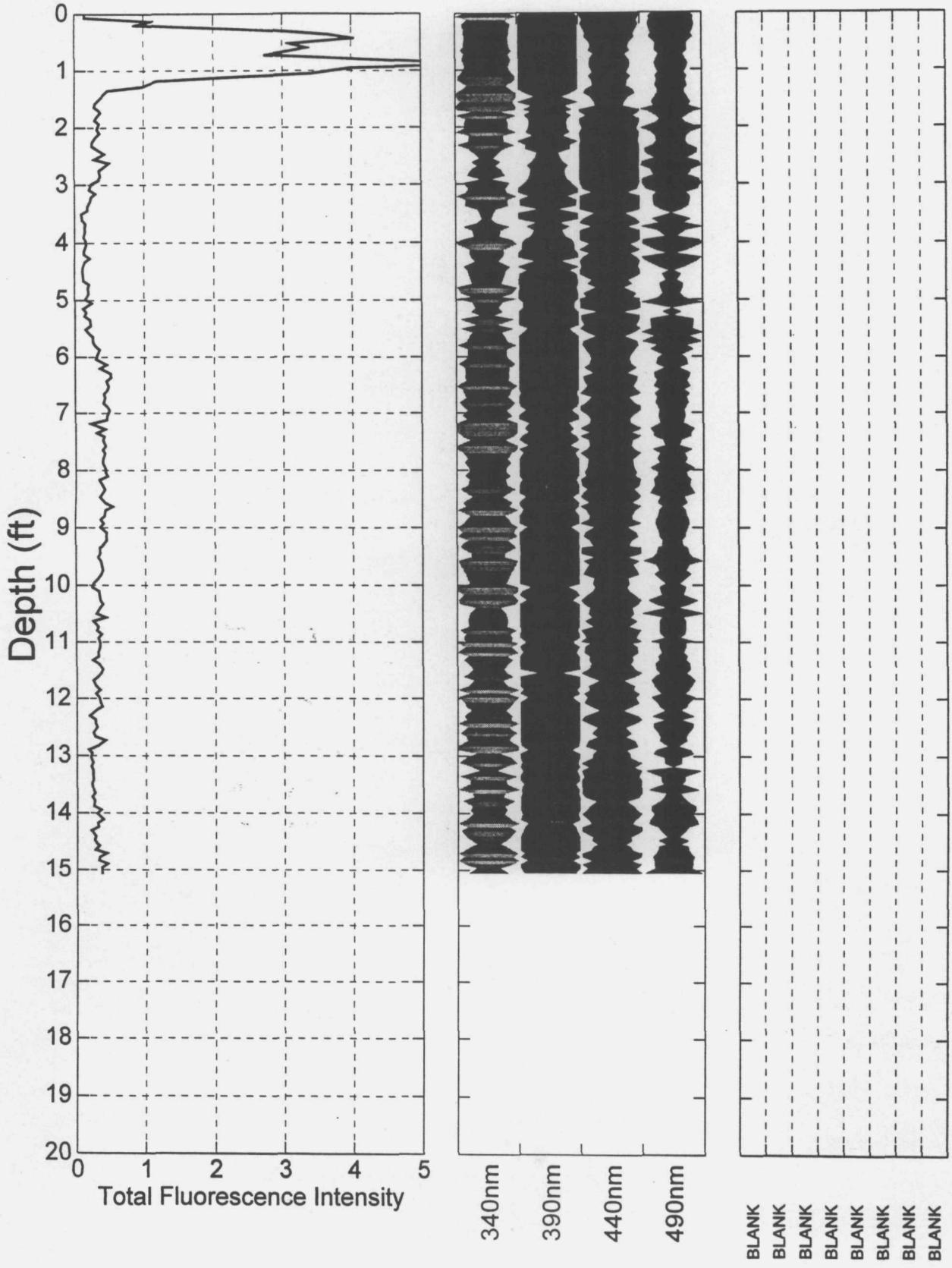


Measured LIF End Depth
15.06 ft
Measured Peak Fluorescence
5.922%

Job#: 0301-8077

Acquisition Date: 04-30-1998

CPT63

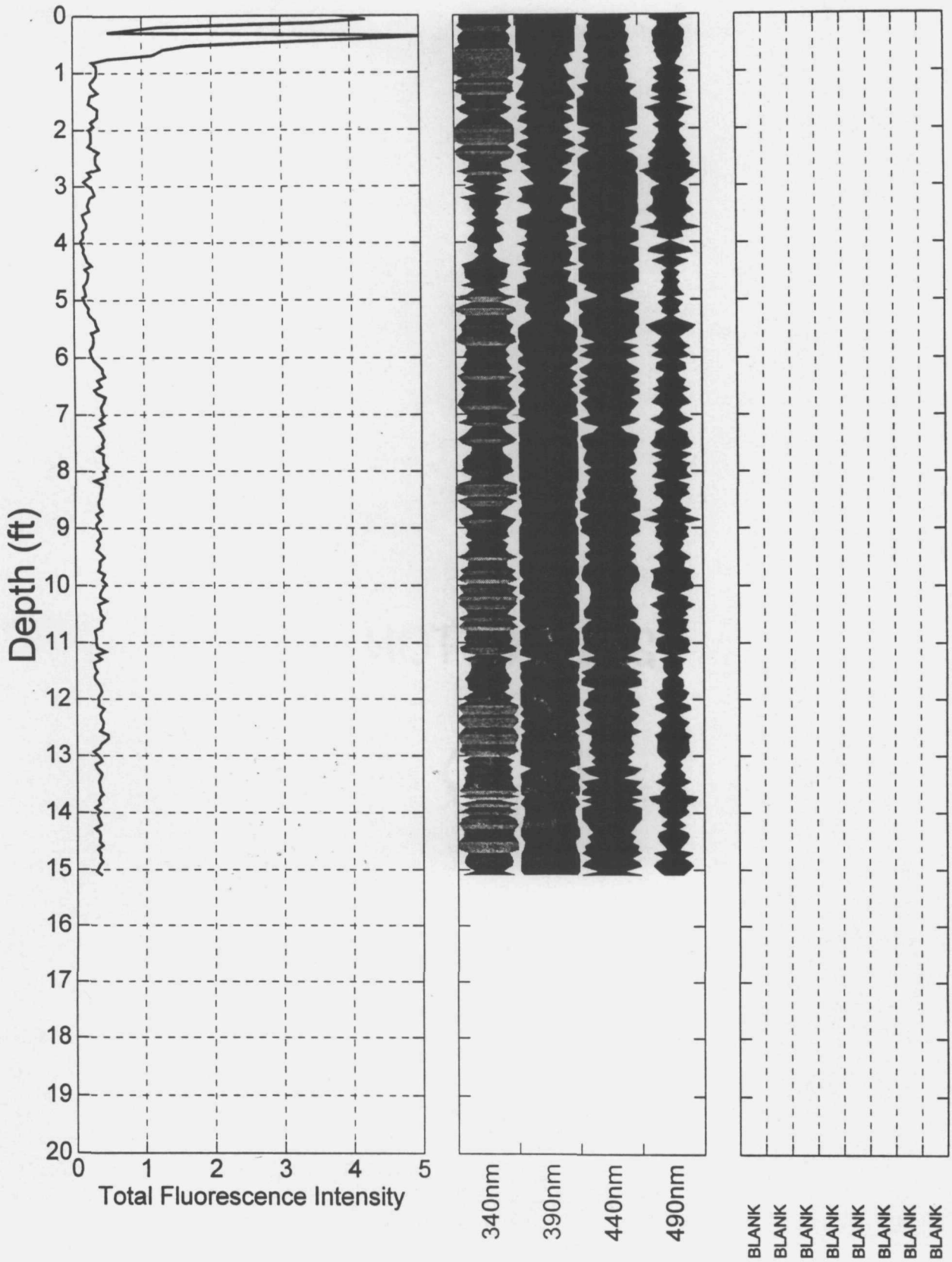


Measured LIF End Depth
15.09 ft
Measured Peak Fluorescence
5.144%

Job#: 0301-8077

Acquisition Date: 04-30-1998

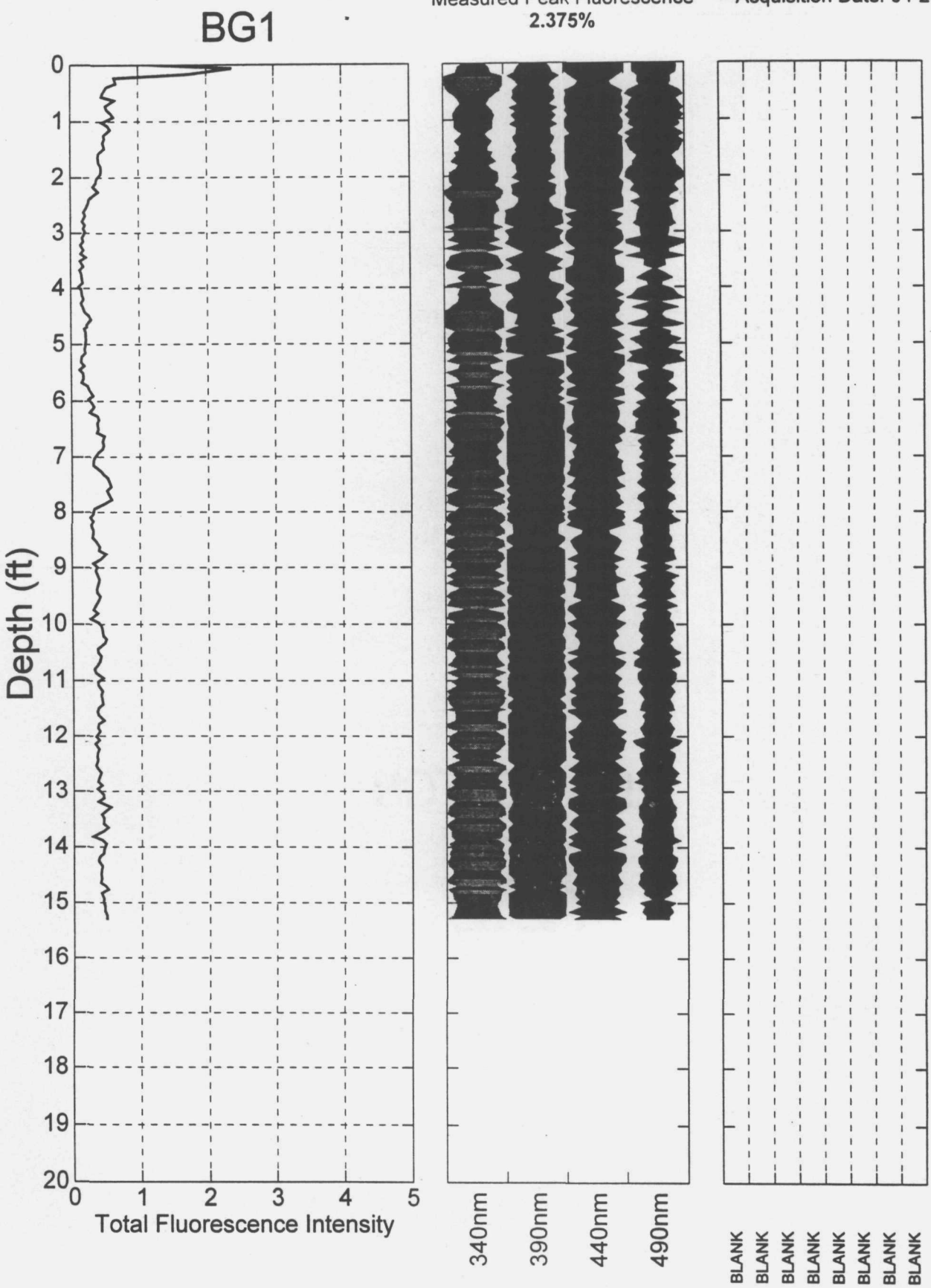
CPT64



Measured LIF End Depth
15.29 ft
Measured Peak Fluorescence
2.375%

Job#: 0301-8077

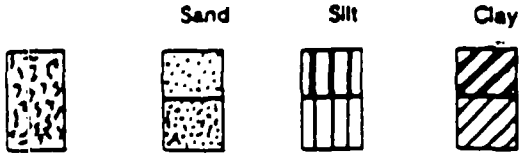
Acquisition Date: 04-28-1998



CPT LOGS

Key To Soil Classification and Symbols

SOIL TYPE
(Shown in Symbol Column)



Predominant Type Shown Heavy

SAMPLE TYPE
(Shown in Samples Column)

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (Major portion Retained on No. 200 Sieve)
Includes (1) clean gravels and sand described as fine, medium or course, depending on distribution of grain sizes (2) silty or clayey gravels and sands and (3) fine grained low plasticity soils (PI < 10) such as sandy silts. Condition is rated according to relative density, as determined by lab tests or estimated from resistance to sampler penetration.

Descriptive Term	Penetration Resistance*	Relative Density
Loose	0 - 10	0 to 40%
Medium Dense	10 - 30	40 to 70%
Dense	30 - 50	70 to 90%
Very Dense	Over 50	90 to 100%

* Blows/Foot, 140# Hammer, 30" Drop

FINE GRAINED SOILS (Major Portion Passing No. 200 Sieve)
Includes (1) inorganic and organic silts and clays, (2) sandy, gravelly or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests for soils with PI $\geq$ 10.

Descriptive Term	Cohesive Shear Strength Tons/Square Foot
Very Soft	Less Than 0.125
Soft	0.125 to 0.25
Firm	0.25 to 0.50
Stiff	0.50 to 1.00
Very Stiff	1.00 to 2.00
Hard	2.00 and Higher

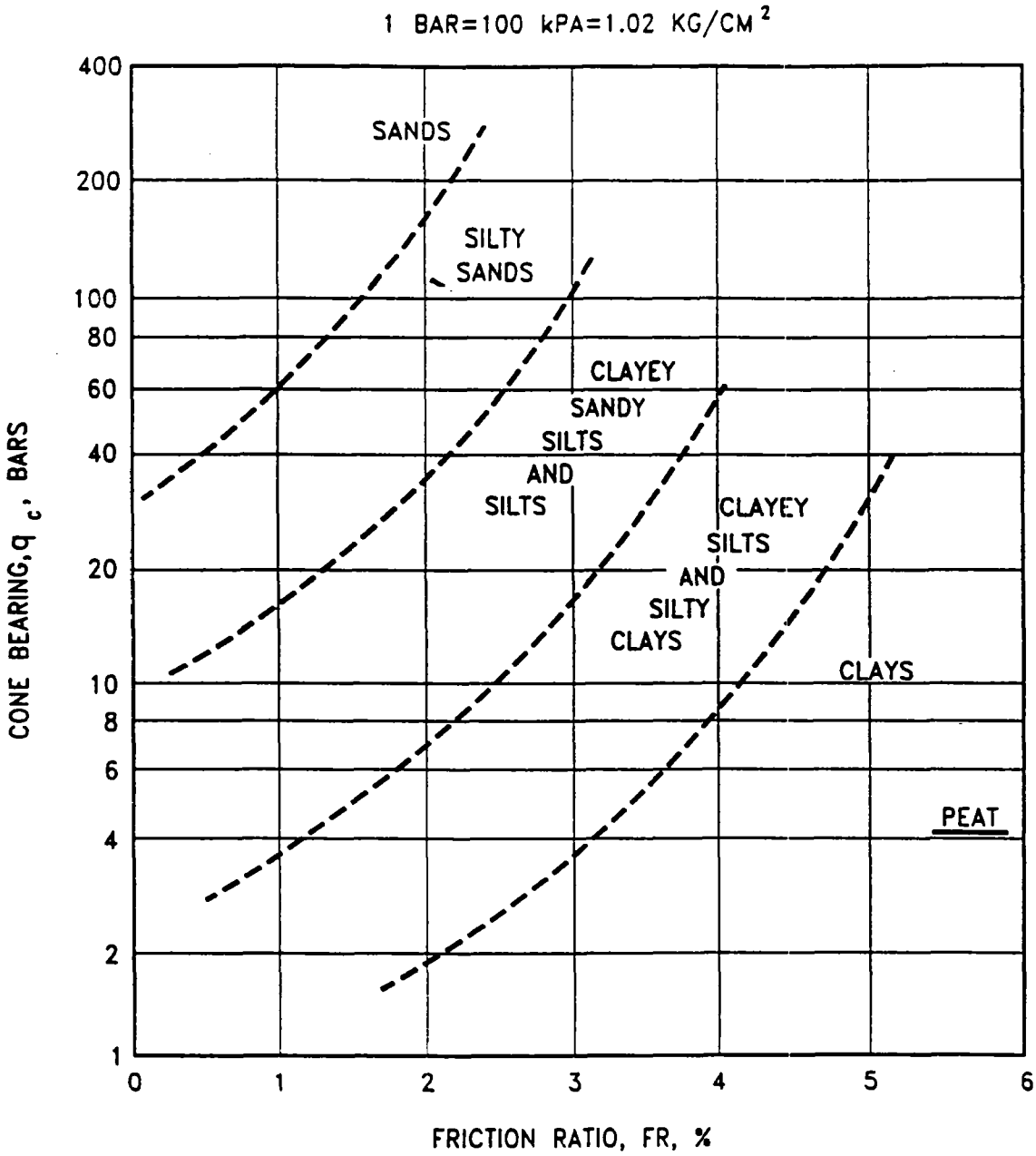
Note: Slickensided and fissured clay may have lower unconfined compressive strengths than shown above because of planes of weakness or shrinkage cracks; consistency ratings of such soils are based on hand penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

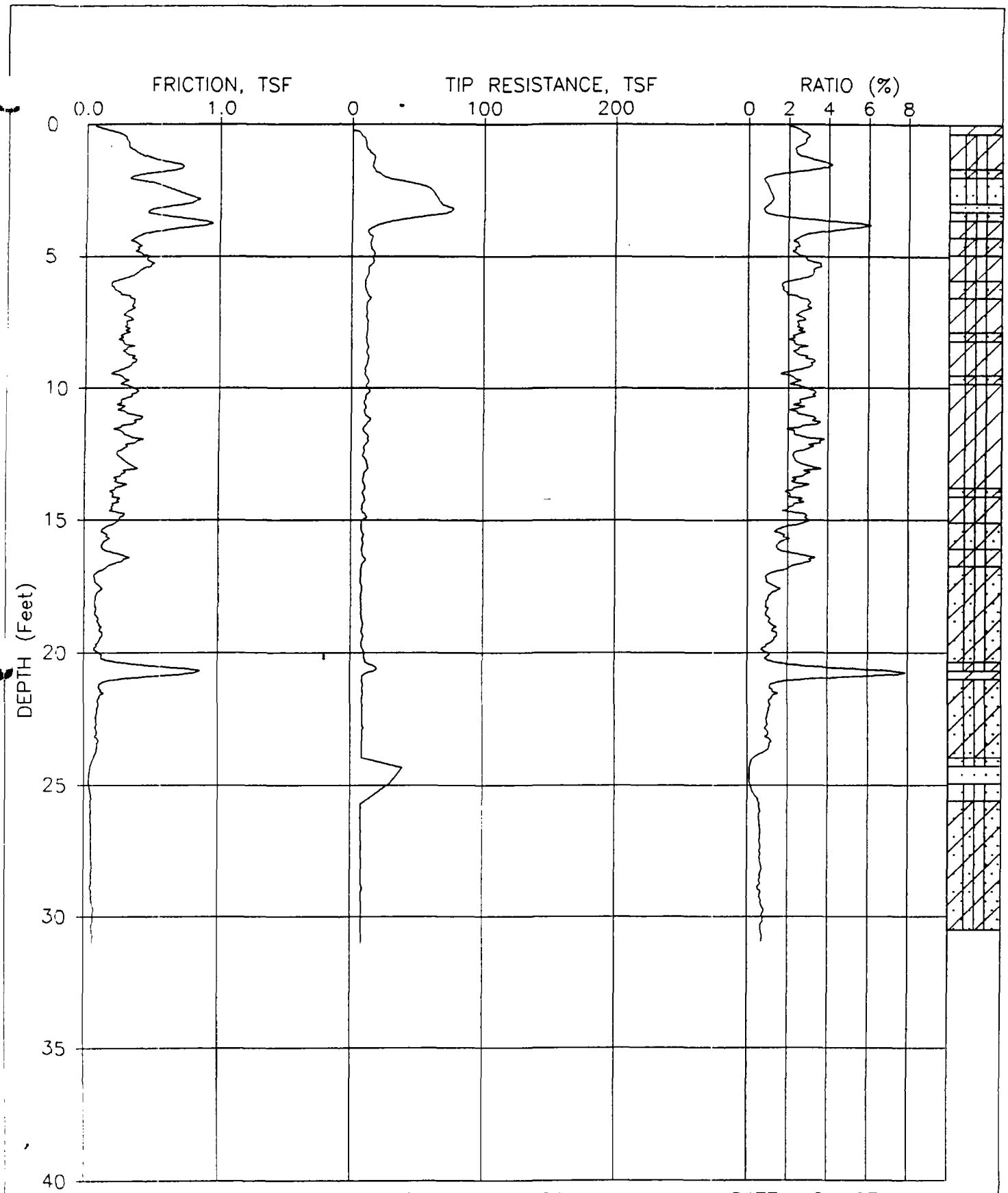
Parting:	paper thin in size
Seam:	1/8" to 3" thick
Layer:	greater than 3"
Fissured:	containing shrinkage cracks, frequently filled with fine sand or silt, usually more or less vertical
Sensitive:	pertaining to cohesive soils that are subject to appreciable loss of strength when remolded
Interbedded:	composed of alternate layers of different soil types
Laminated:	composed of thin layers of varying color and texture
Calcareous:	containing appreciable quantities of calcium carbonate
Well Graded:	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Poorly Graded:	predominantly of one grain size, or having a range of sizes with some intermediate size missing
Flocculated:	pertaining to cohesive soils that exhibit a loose knit or flakey structure
Slickensided:	having inclined planes of weakness that are slick and glossy in appearance.

Degree of Slickensided Development

Slightly Slickensided:	slickensides present at intervals of 1' to 2', soil does not easily break along these plates
Moderately Slickensided:	slickensides spaced at intervals of 1' to 2', soil breaks easily along these planes
Extremely Slickensided:	continuous and interconnected slickensides spaced at intervals of 4" to 12', soil breaks along the slickensides into pieces 3" to 6" in size
Intensely Slickensided:	slickensides spaced at intervals of less than 4", continuous in all directions; soil breaks down along planes into nodules 1/4" to 2" in size.



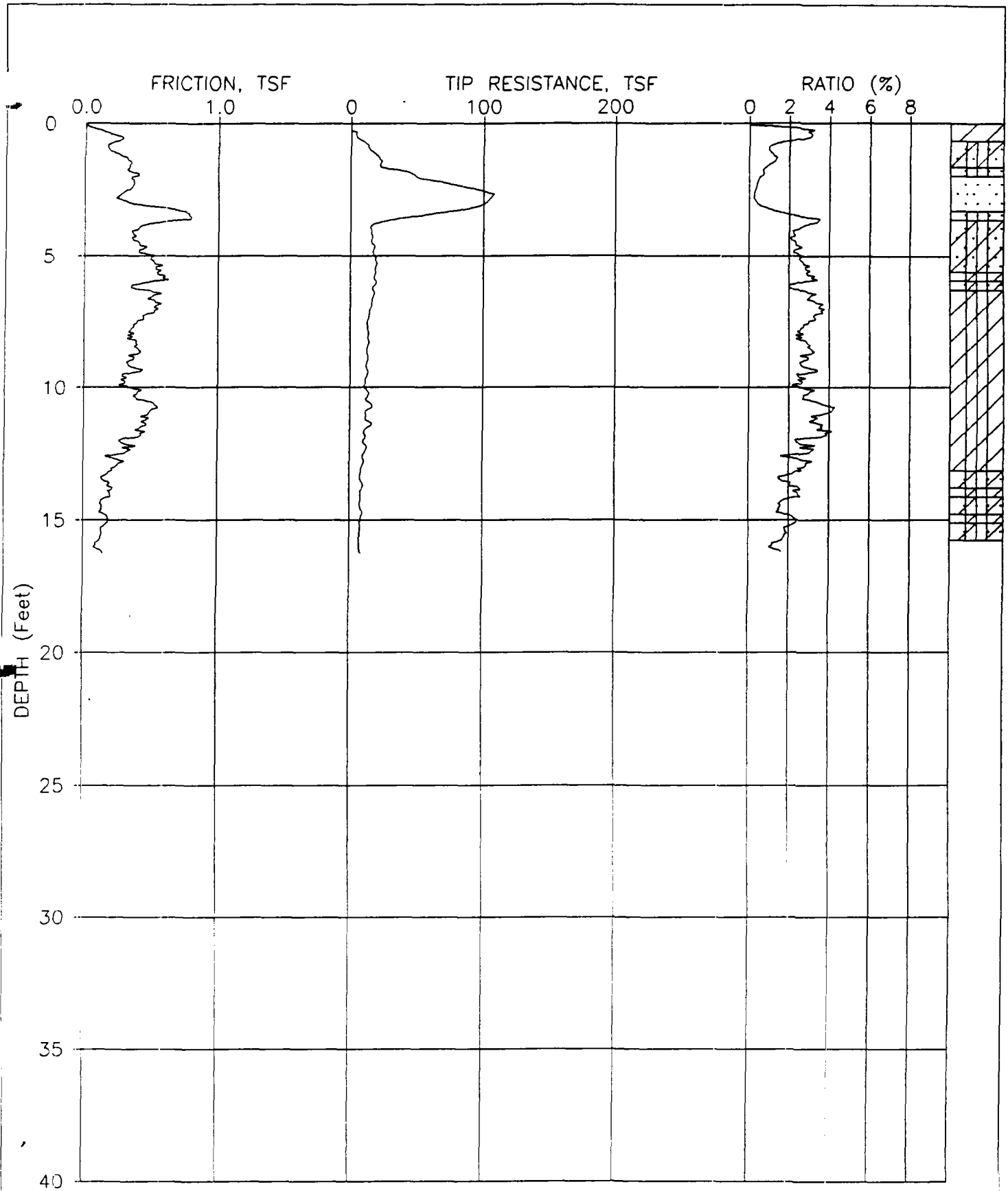
ROBERTSON AND CAMPANELLA SIMPLIFIED SOIL BEHAVIOR CHART (1983)



JOB NUMBER: 98-8077 CPT NUMBER: 01 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

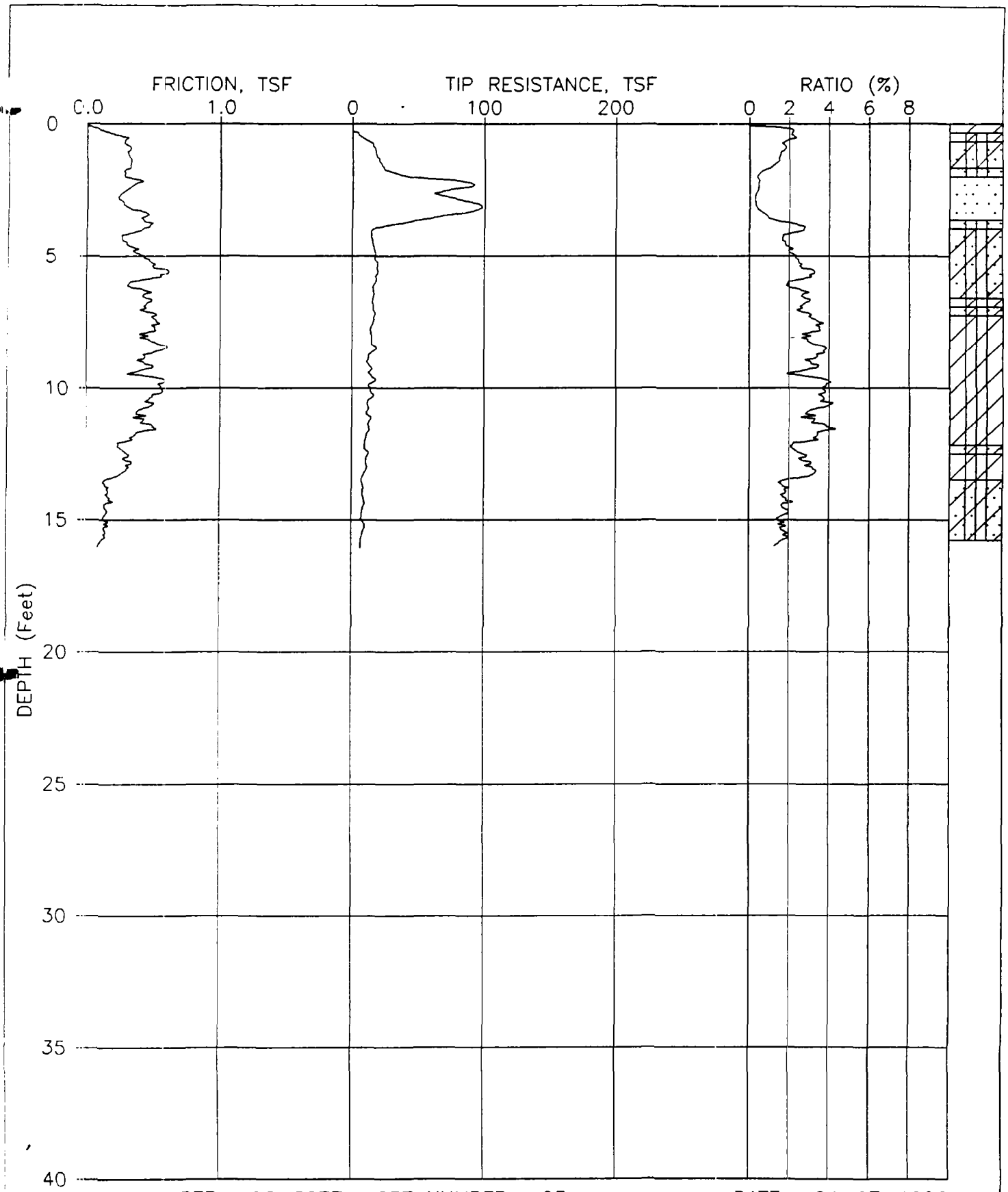
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 02 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

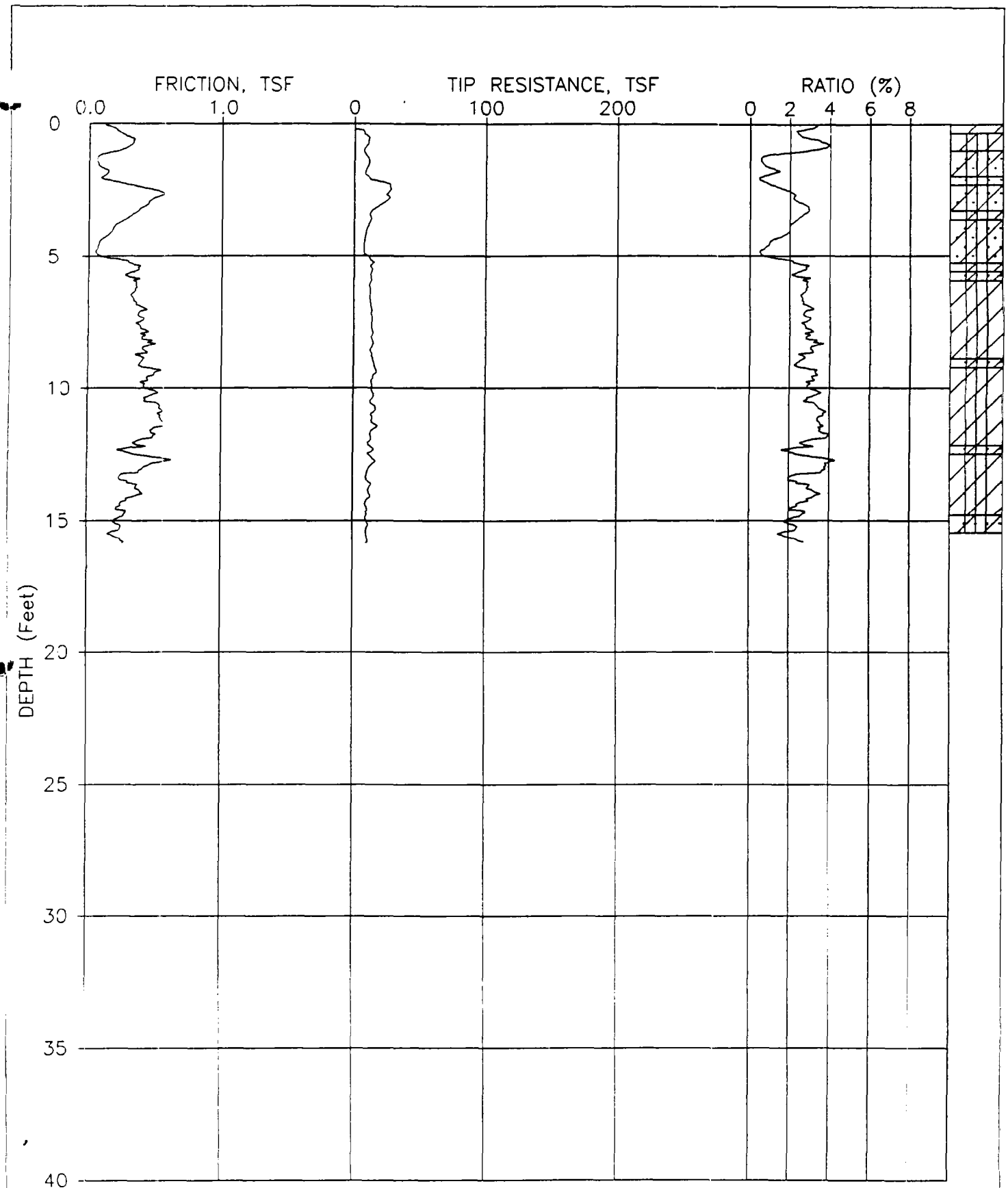
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 03 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

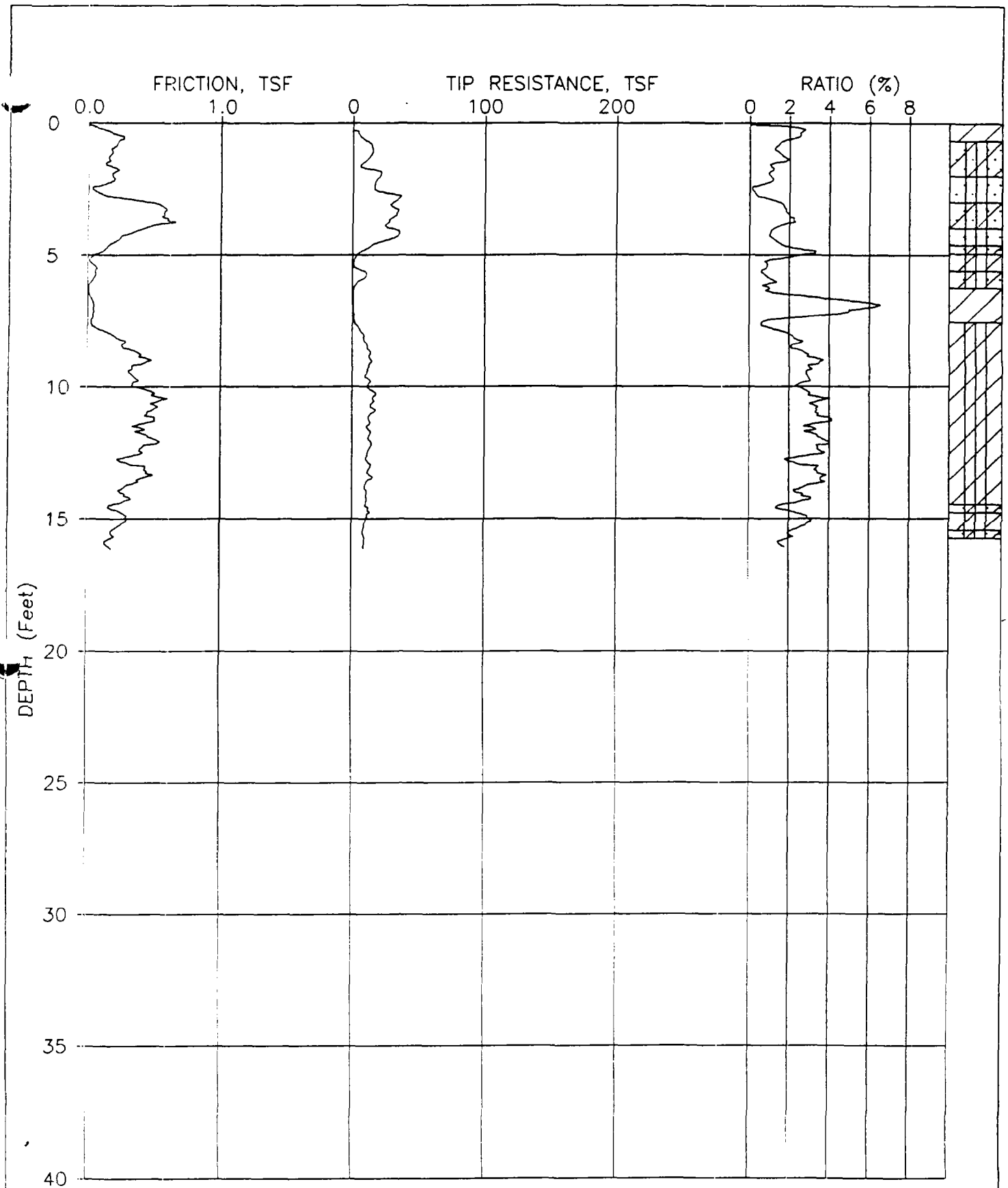
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 04 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

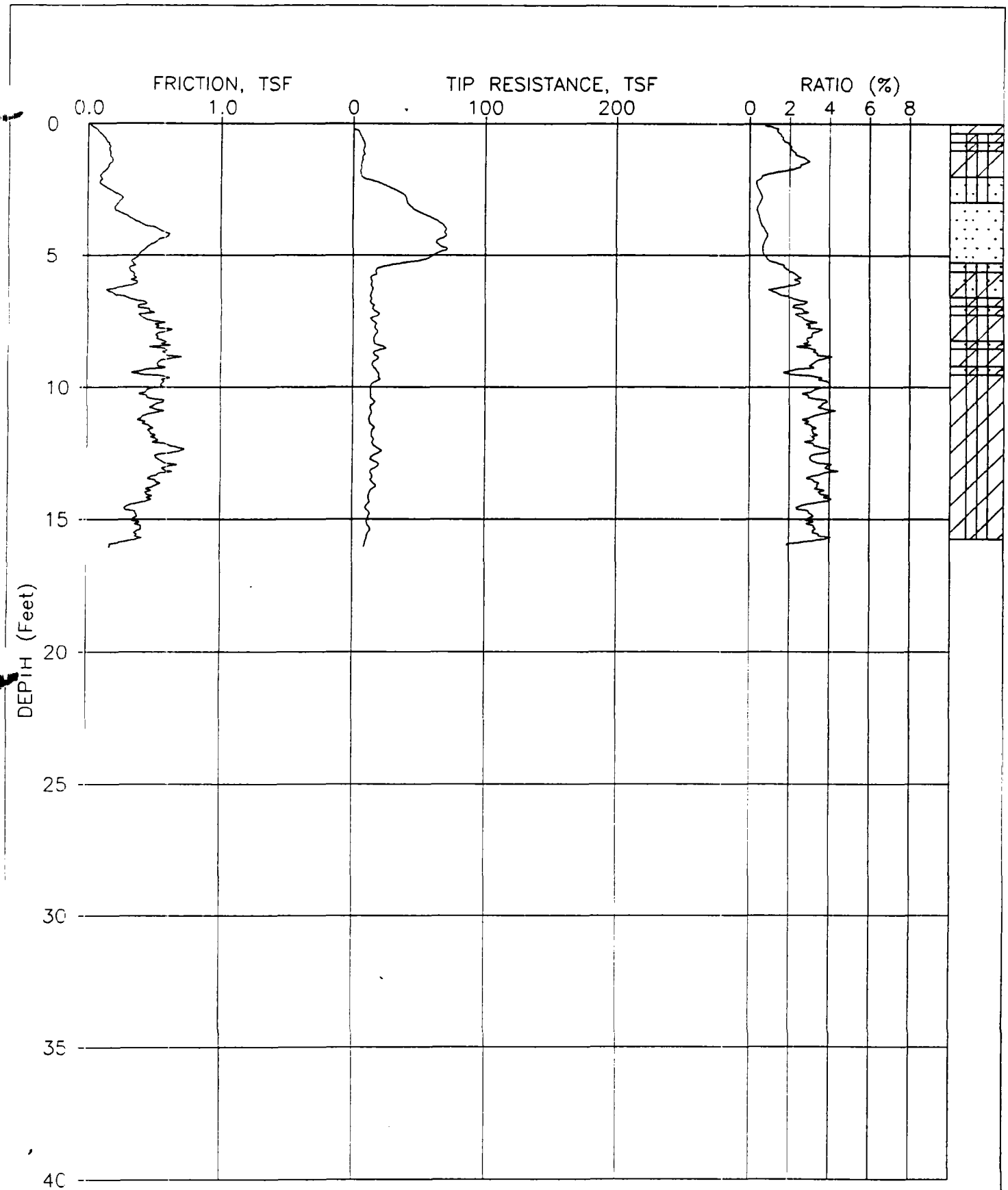
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 05 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

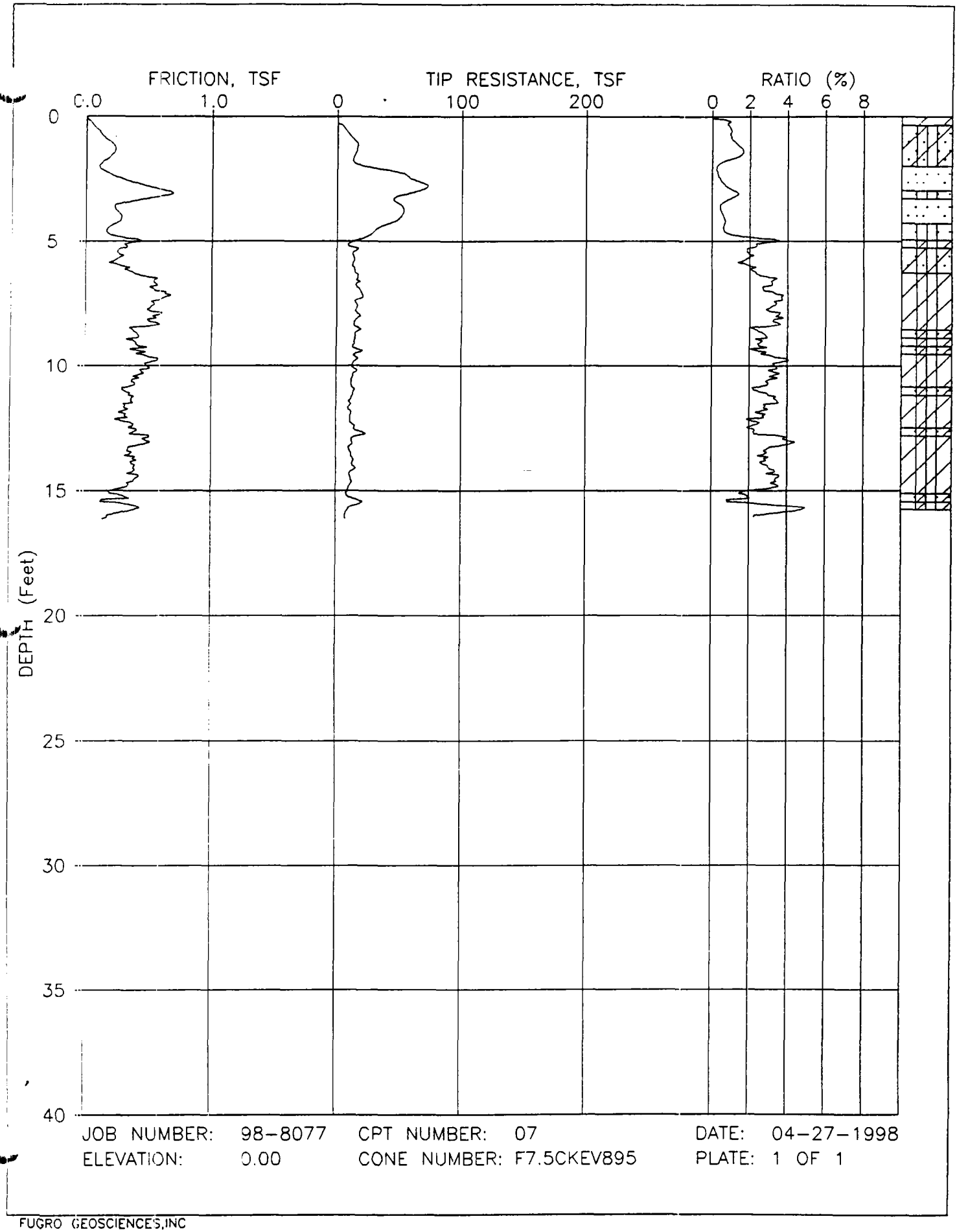
FUGRO GEOSCIENCES,INC



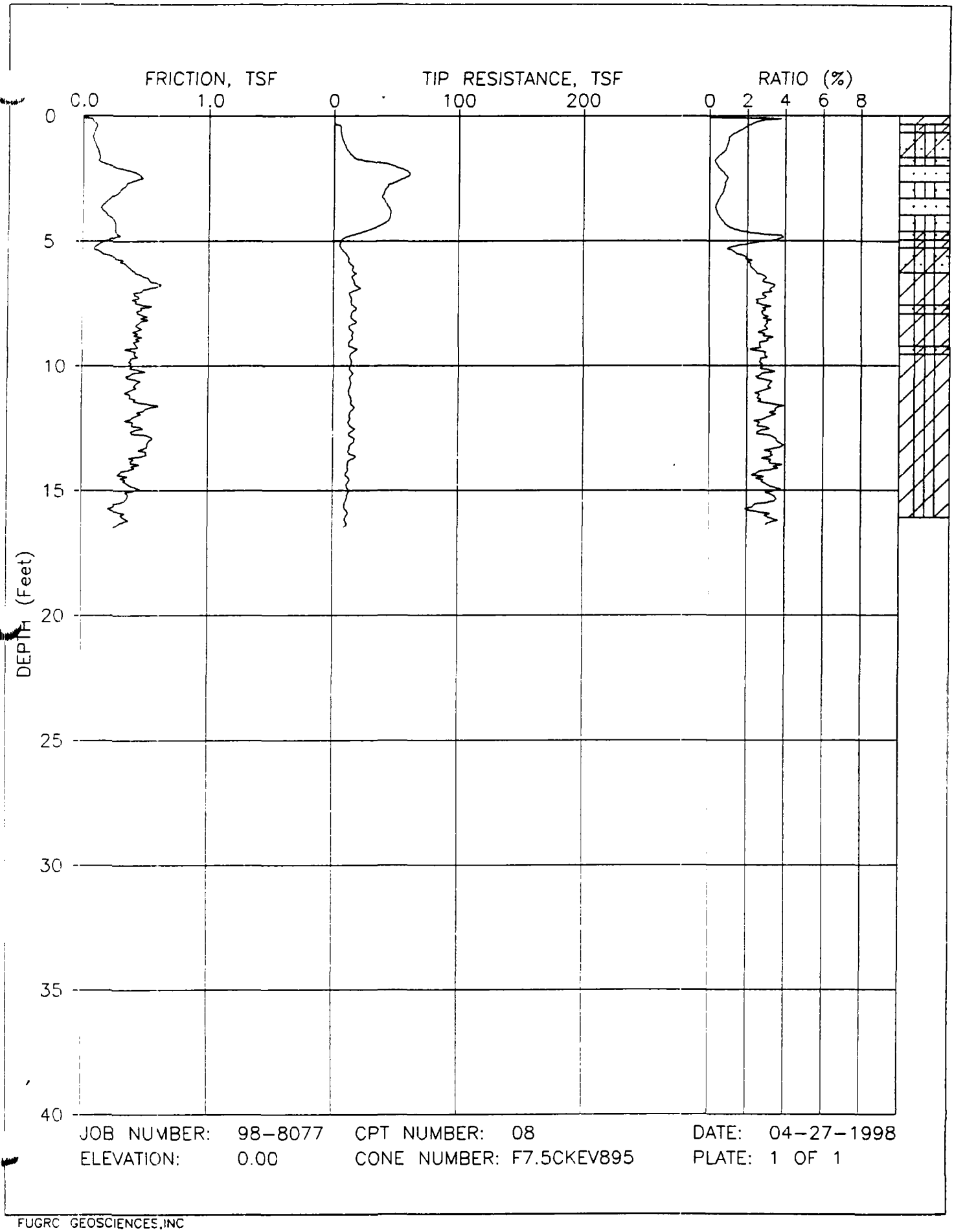
JOB NUMBER: 98-8077 CPT NUMBER: 06 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



FUGRO GEOSCIENCES,INC



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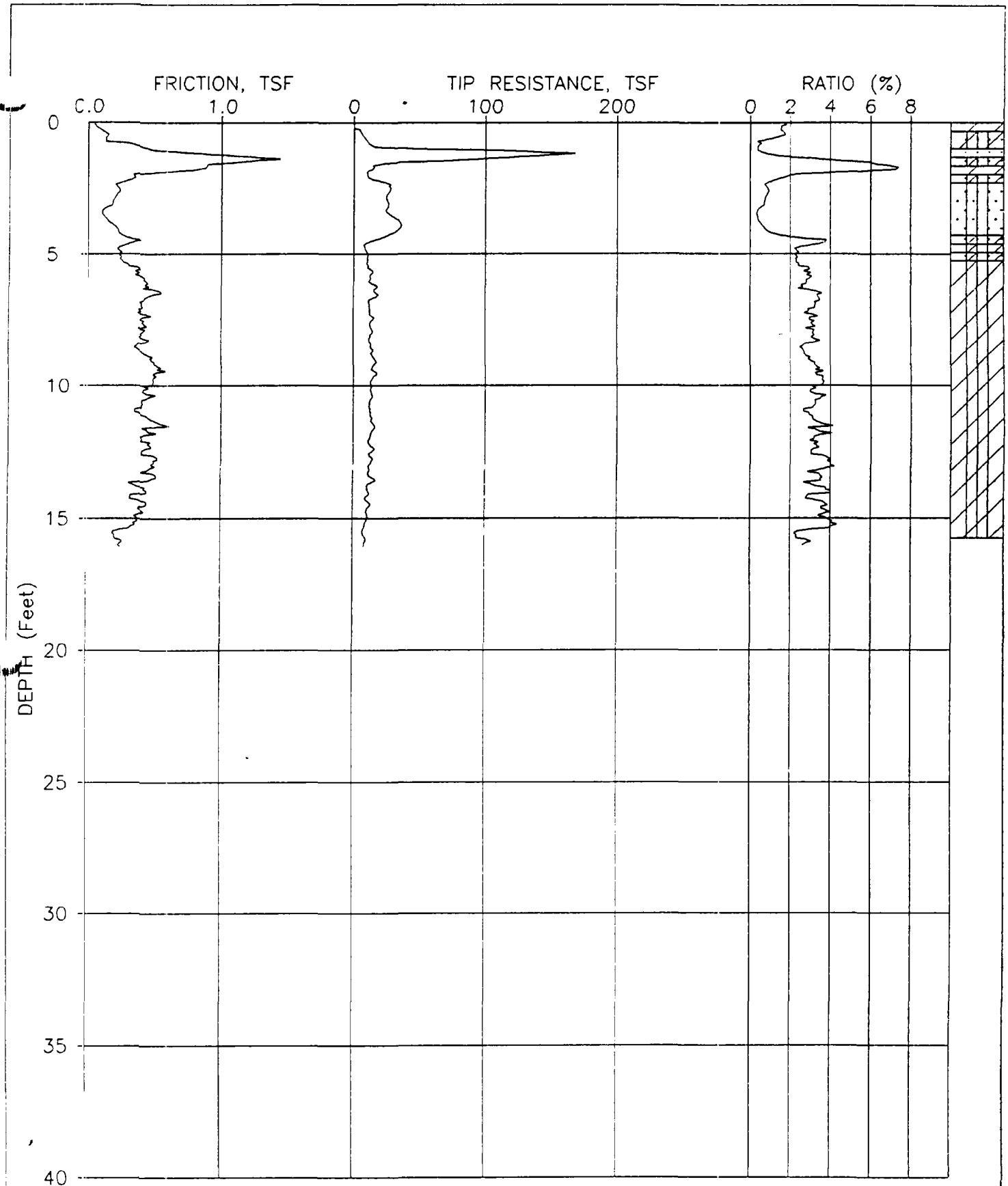
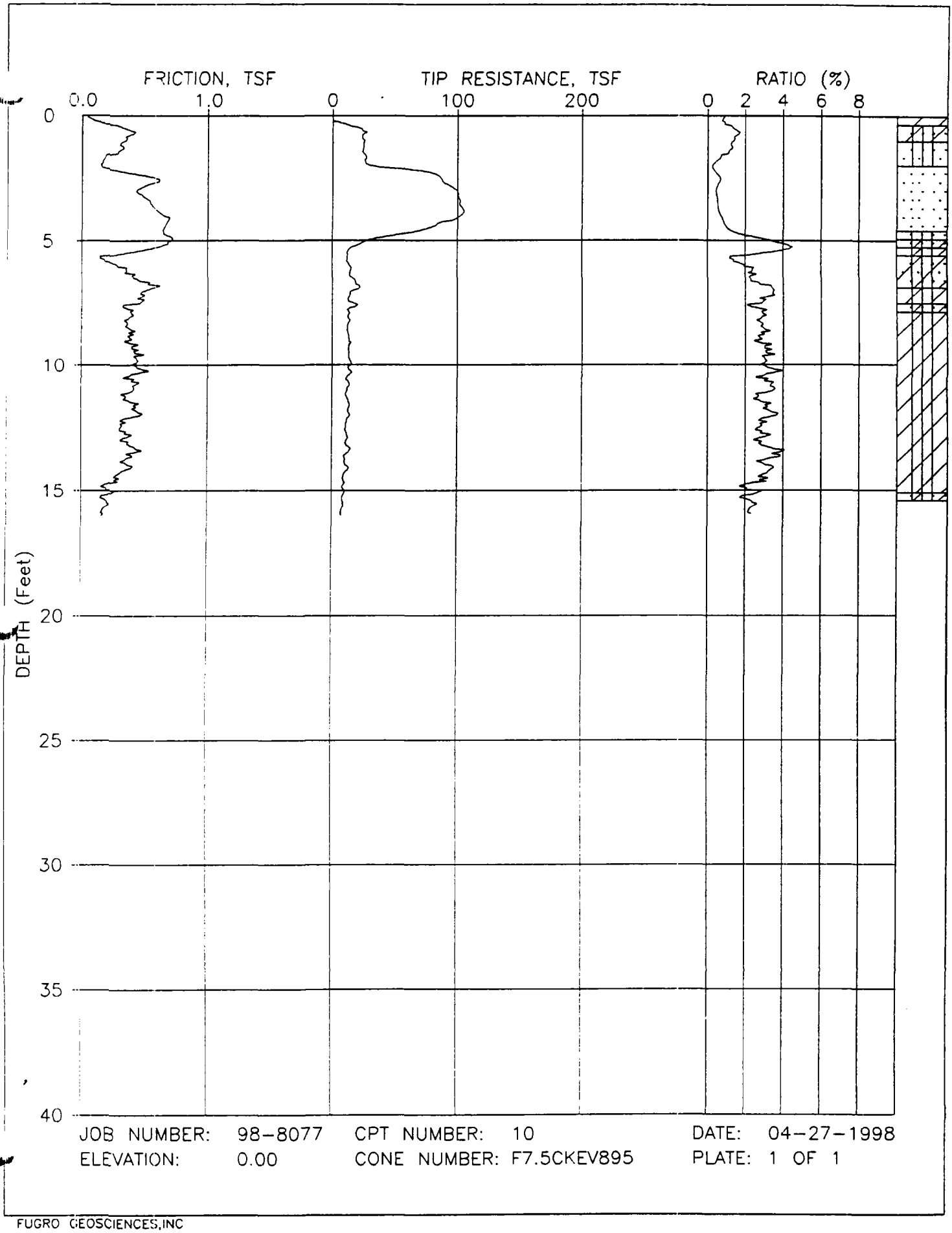


JOB NUMBER: 98-8077 CPT NUMBER: 09 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

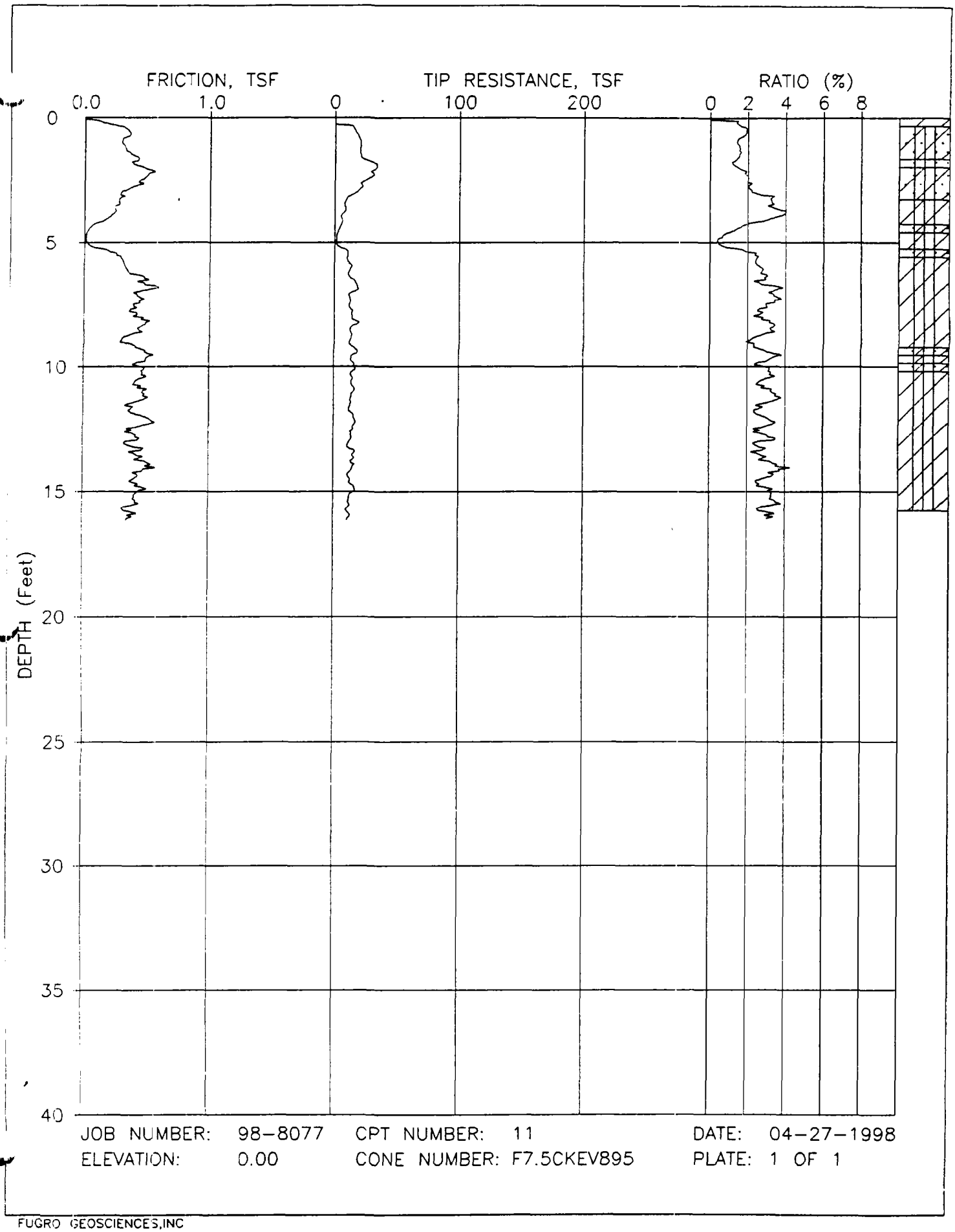
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 10 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

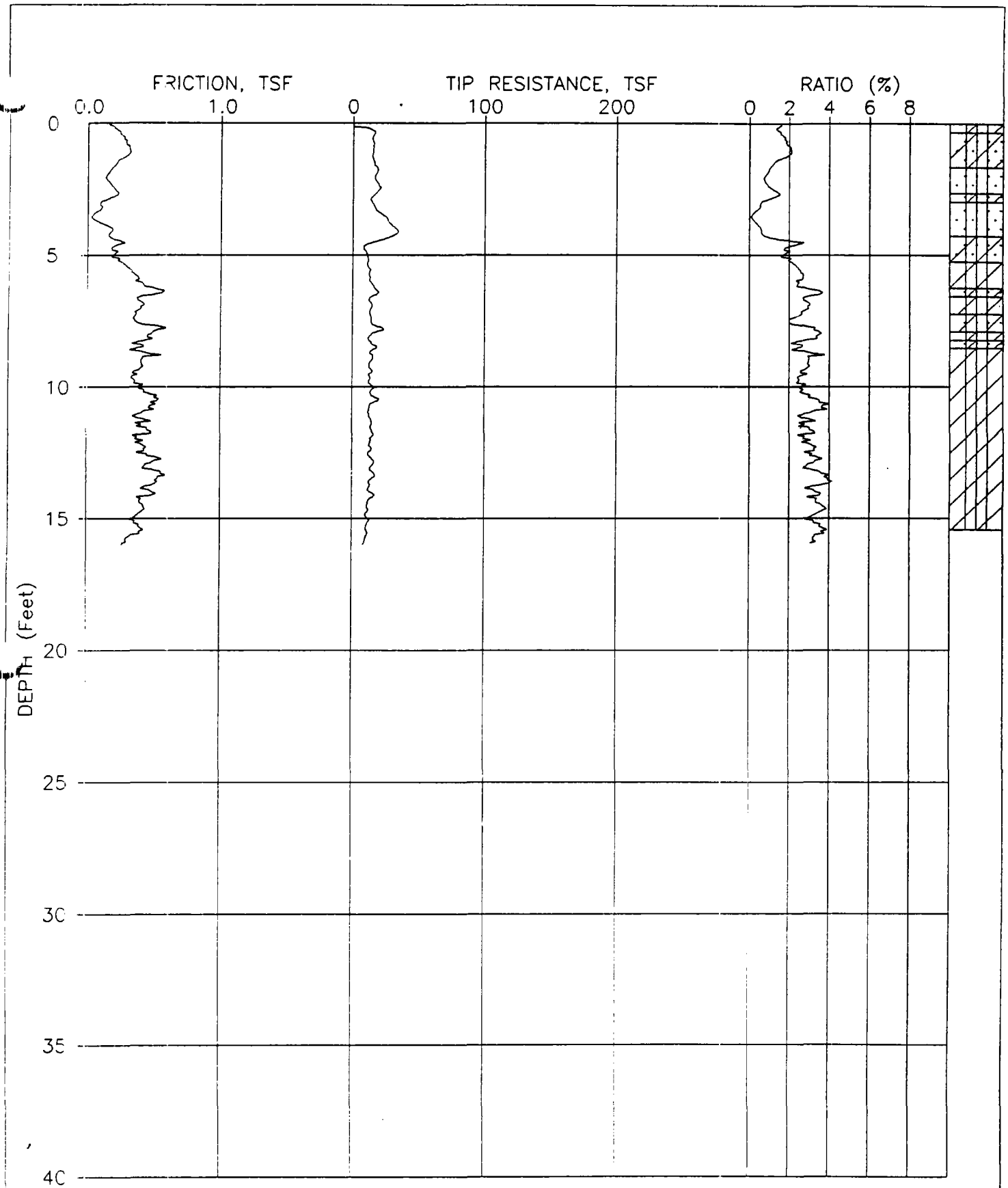
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 11 DATE: 04-27-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

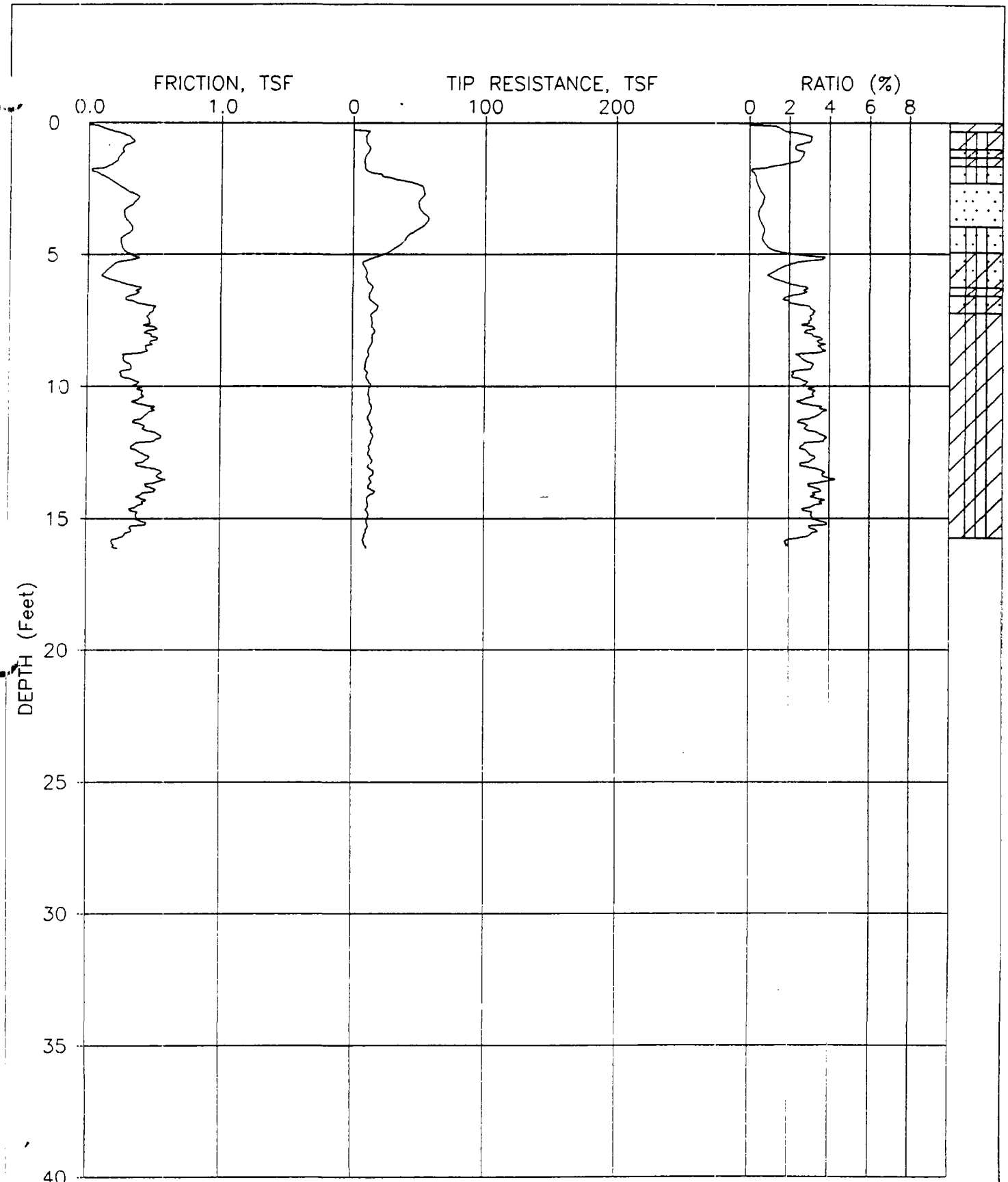
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 12 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

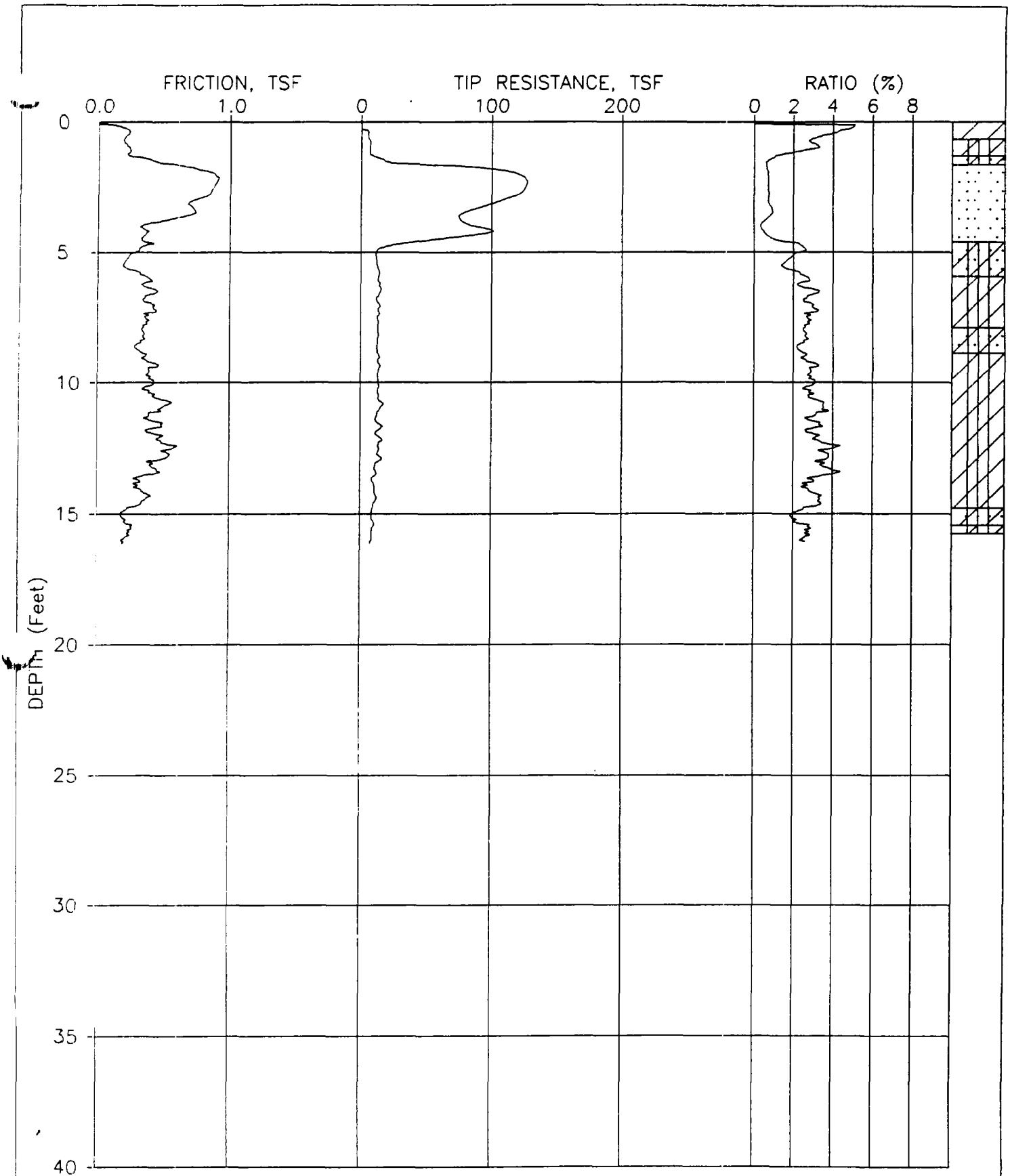
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 13 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 14 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

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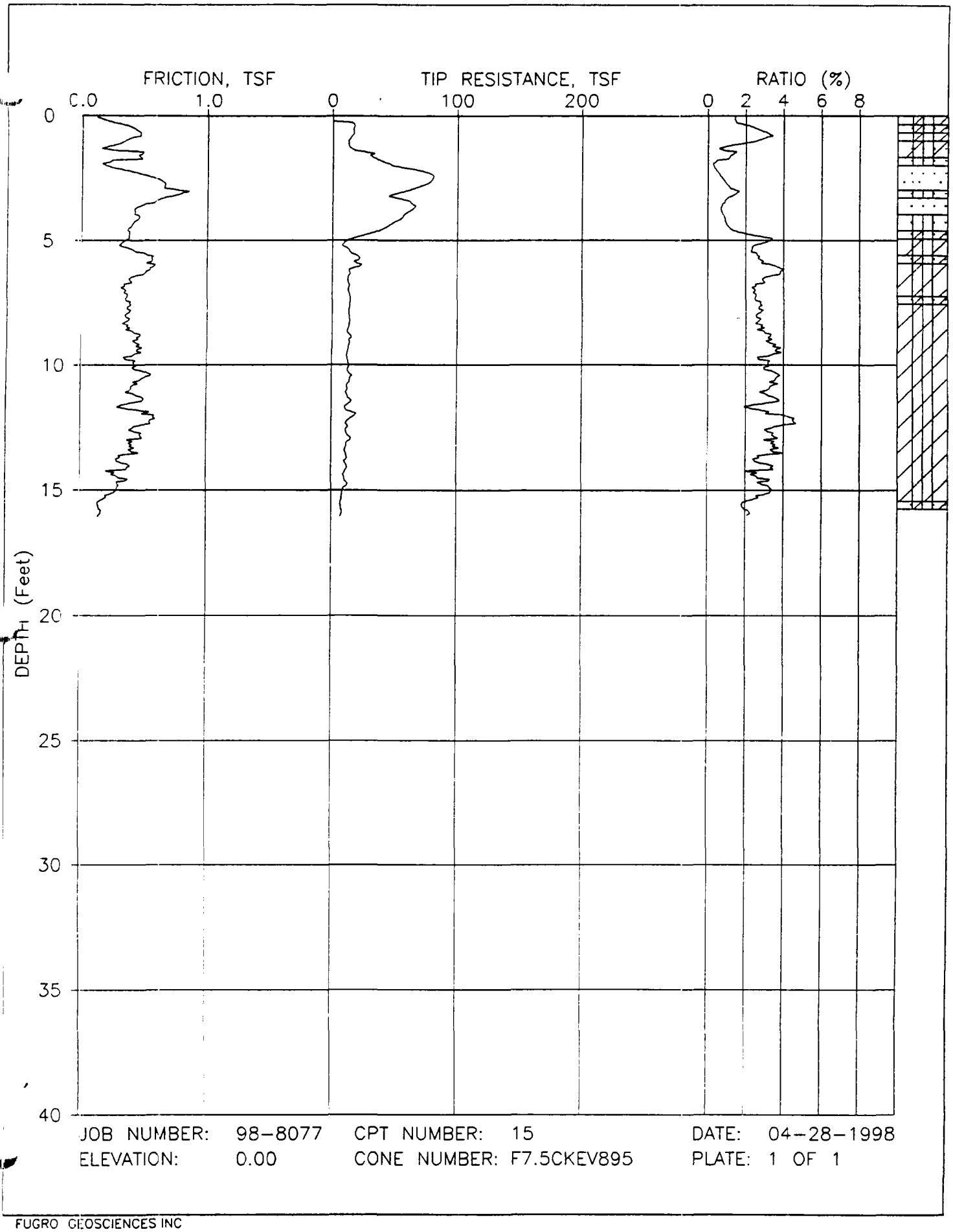
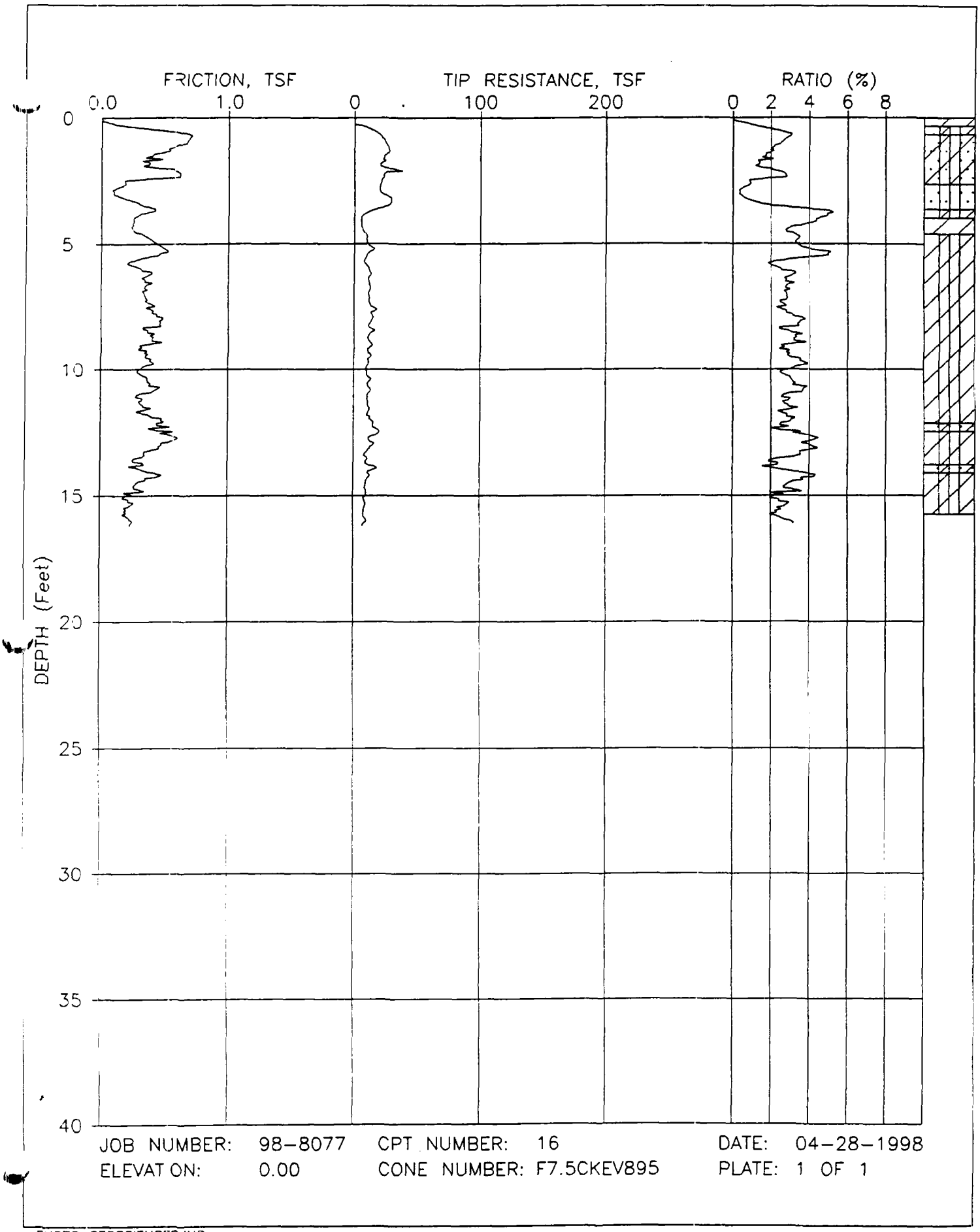


JOB NUMBER: 98-8077 CPT NUMBER: 15 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES INC



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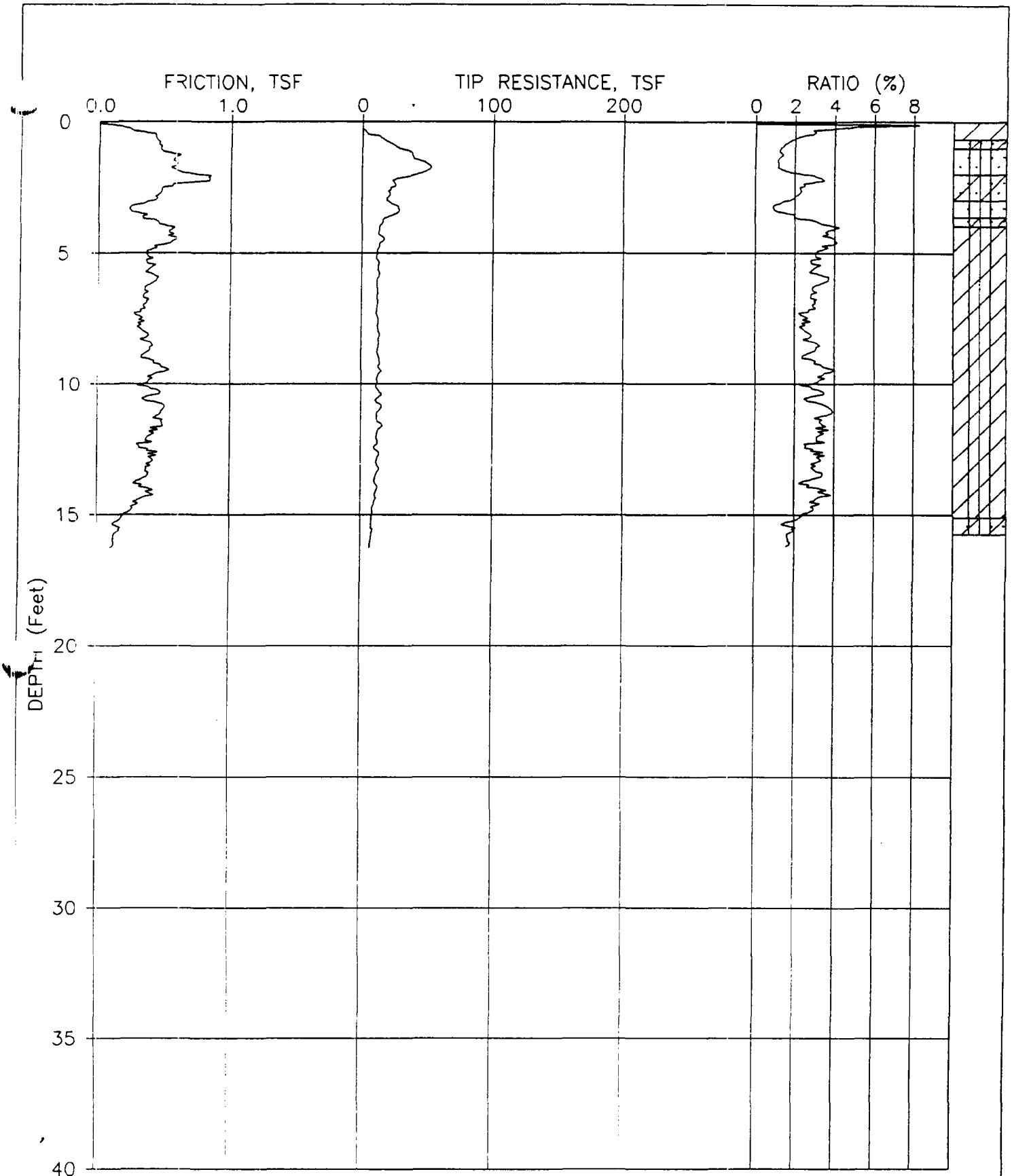
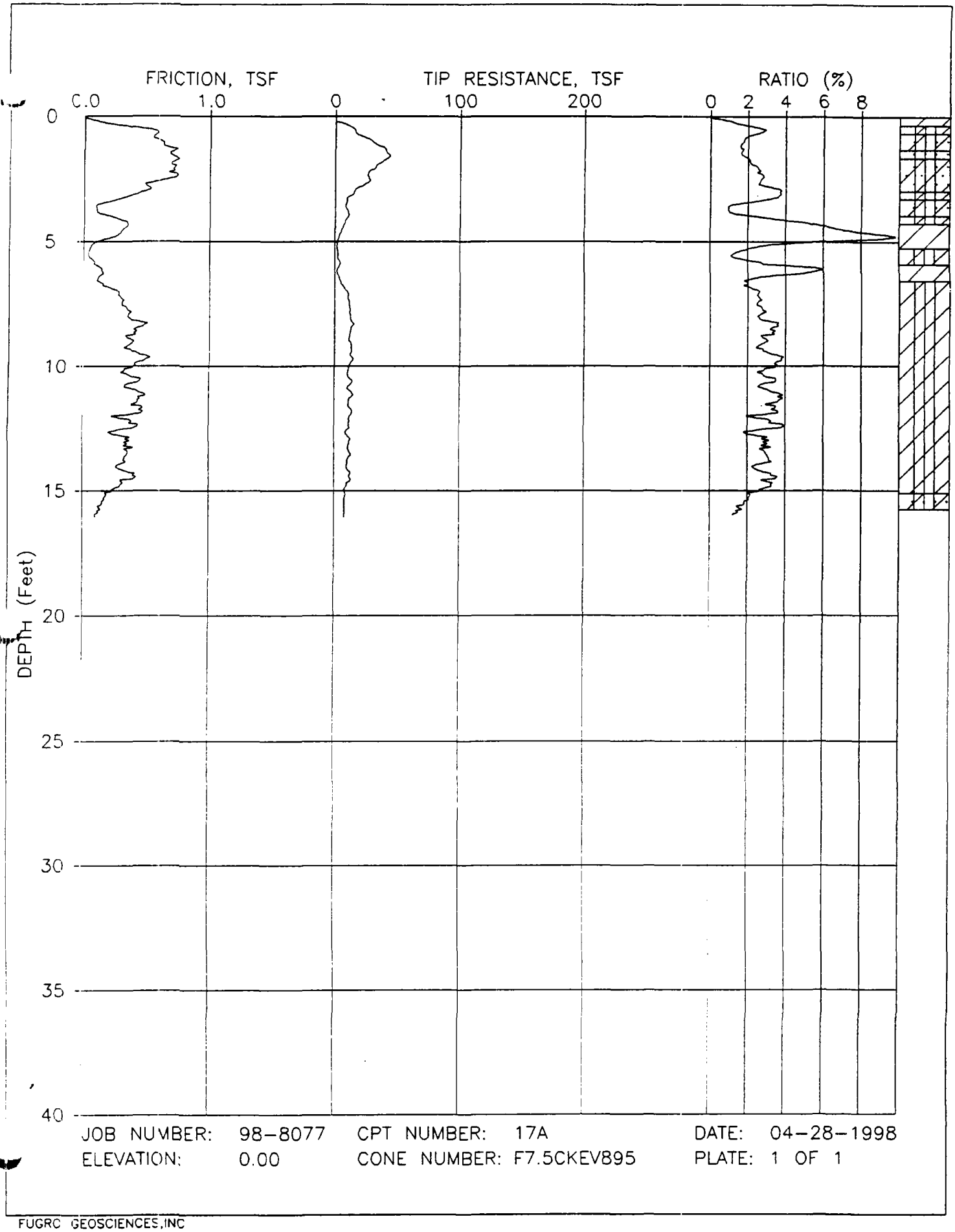


JOB NUMBER: 98-8077 CPT NUMBER: 17 DATE: 04-28-1998

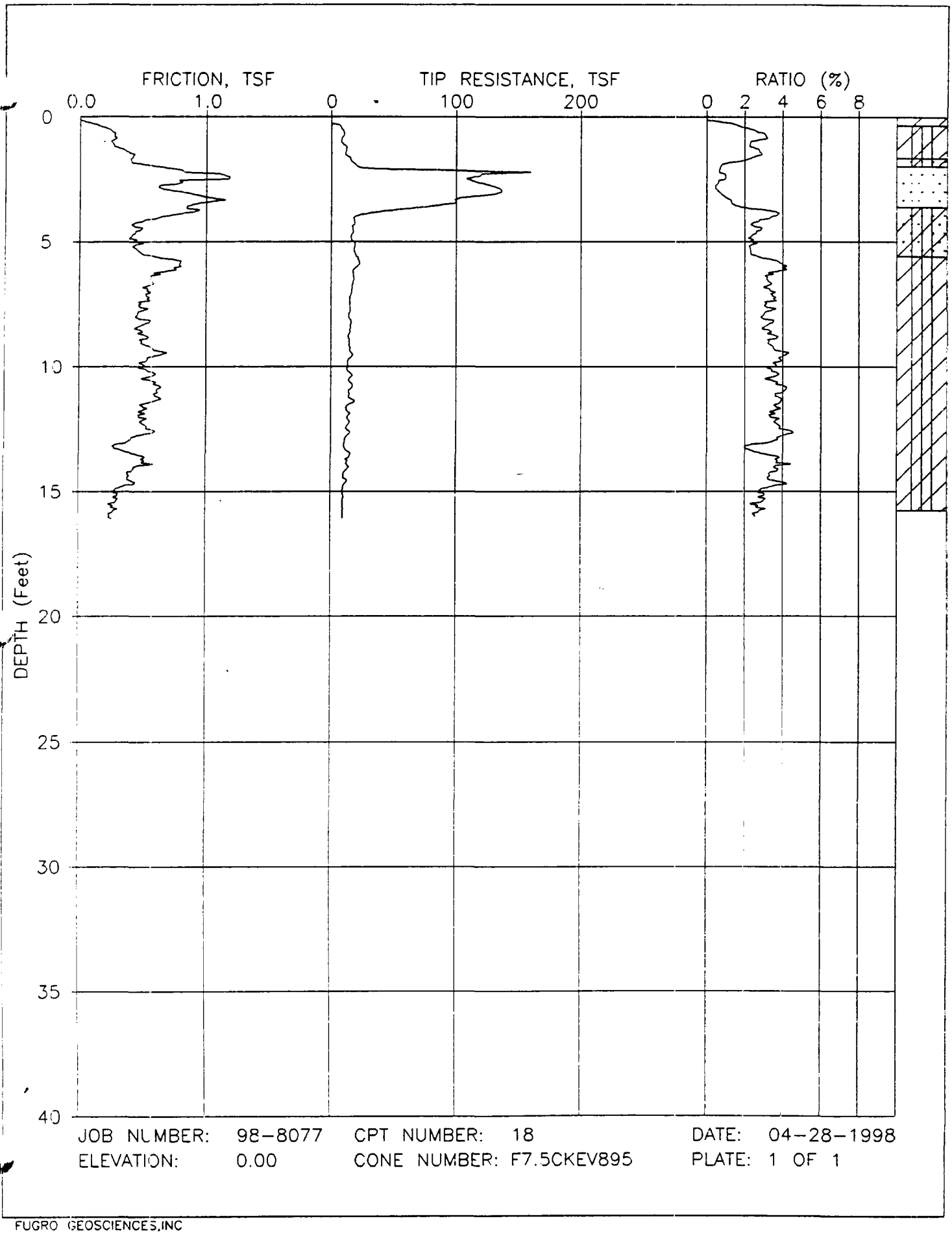
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 17A DATE: 04-28-1998
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

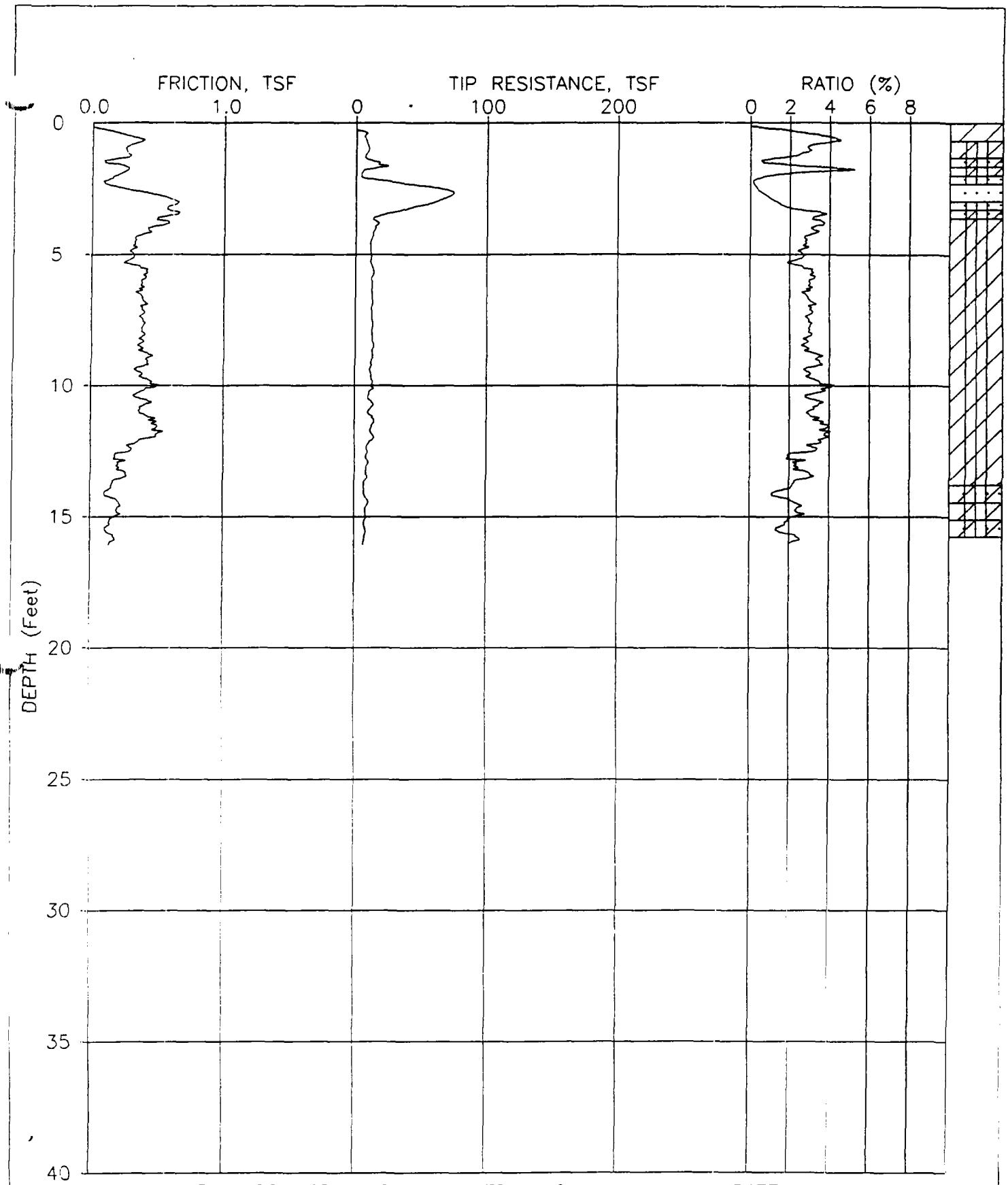
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 18 DATE: 04-28-1998

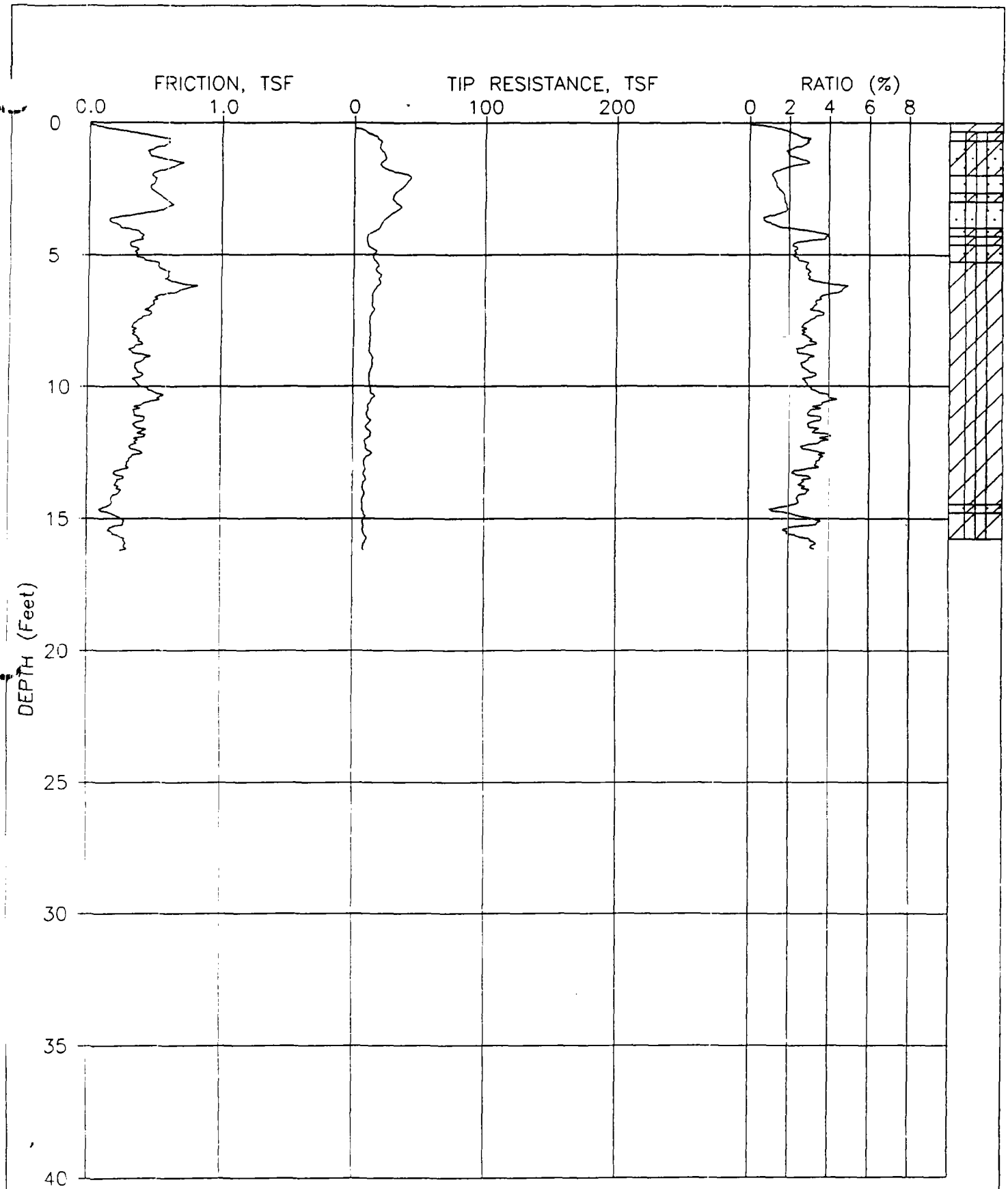
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 19 DATE: 04-28-1998
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

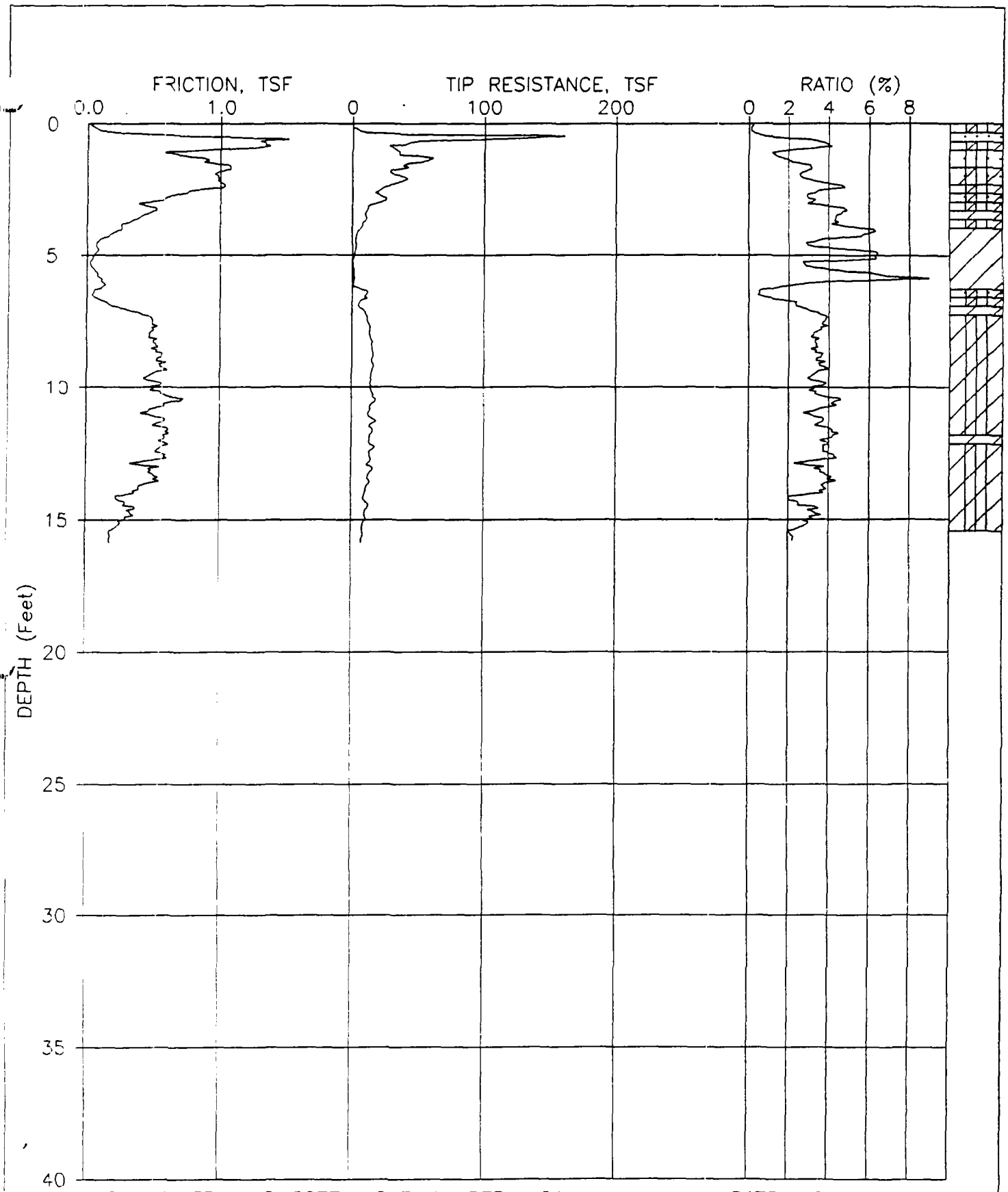
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 20 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

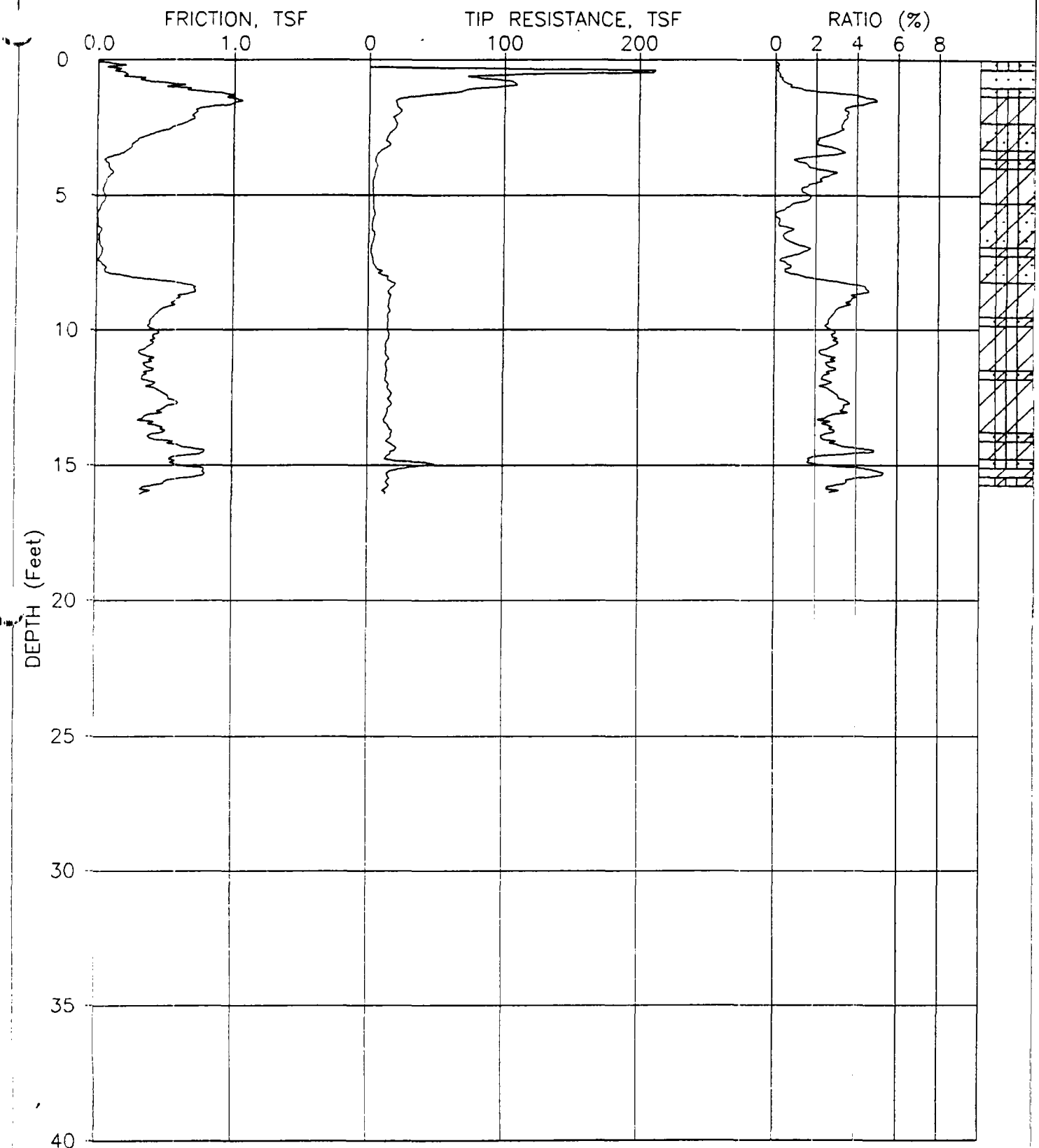
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 21 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

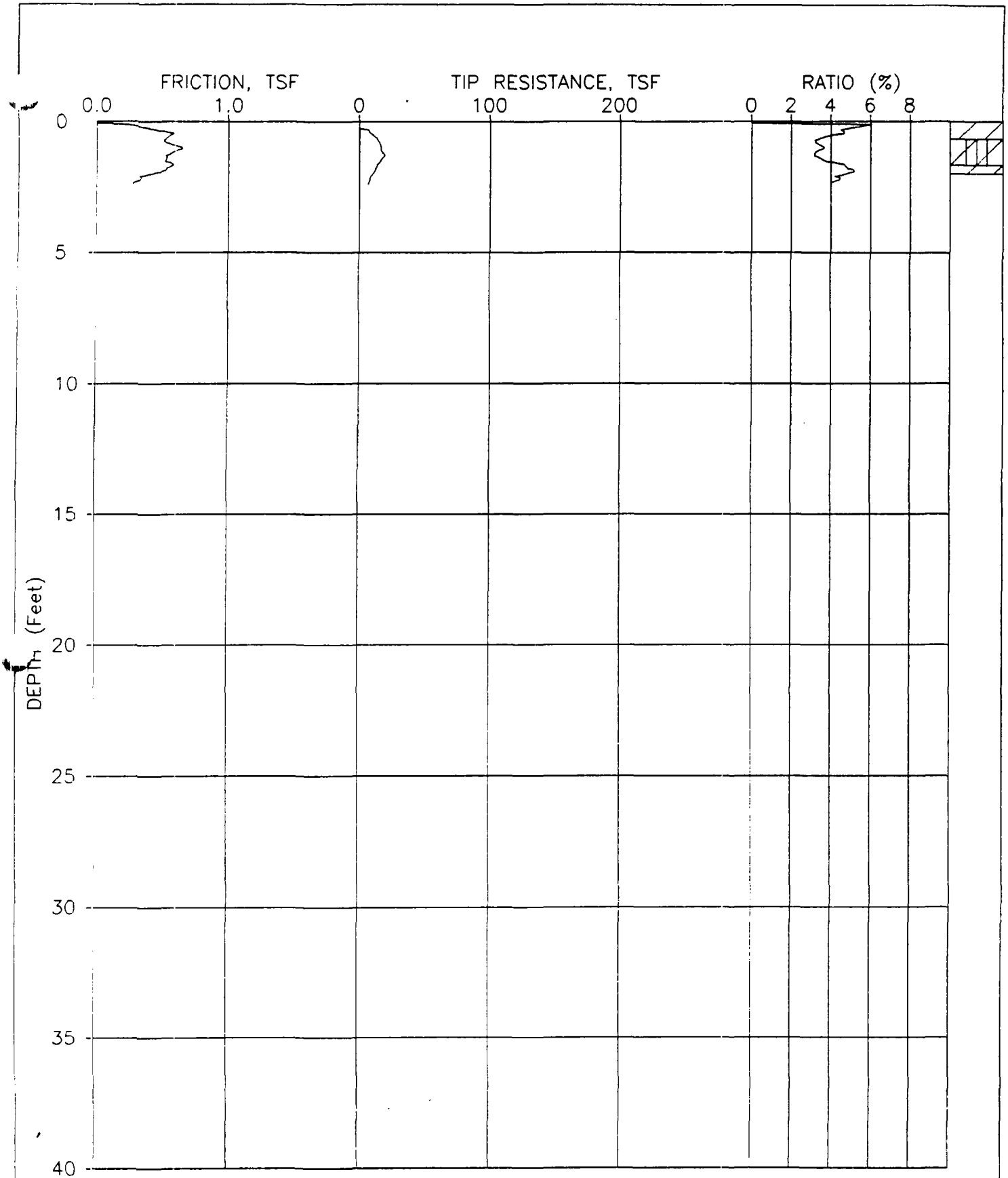
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 22 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

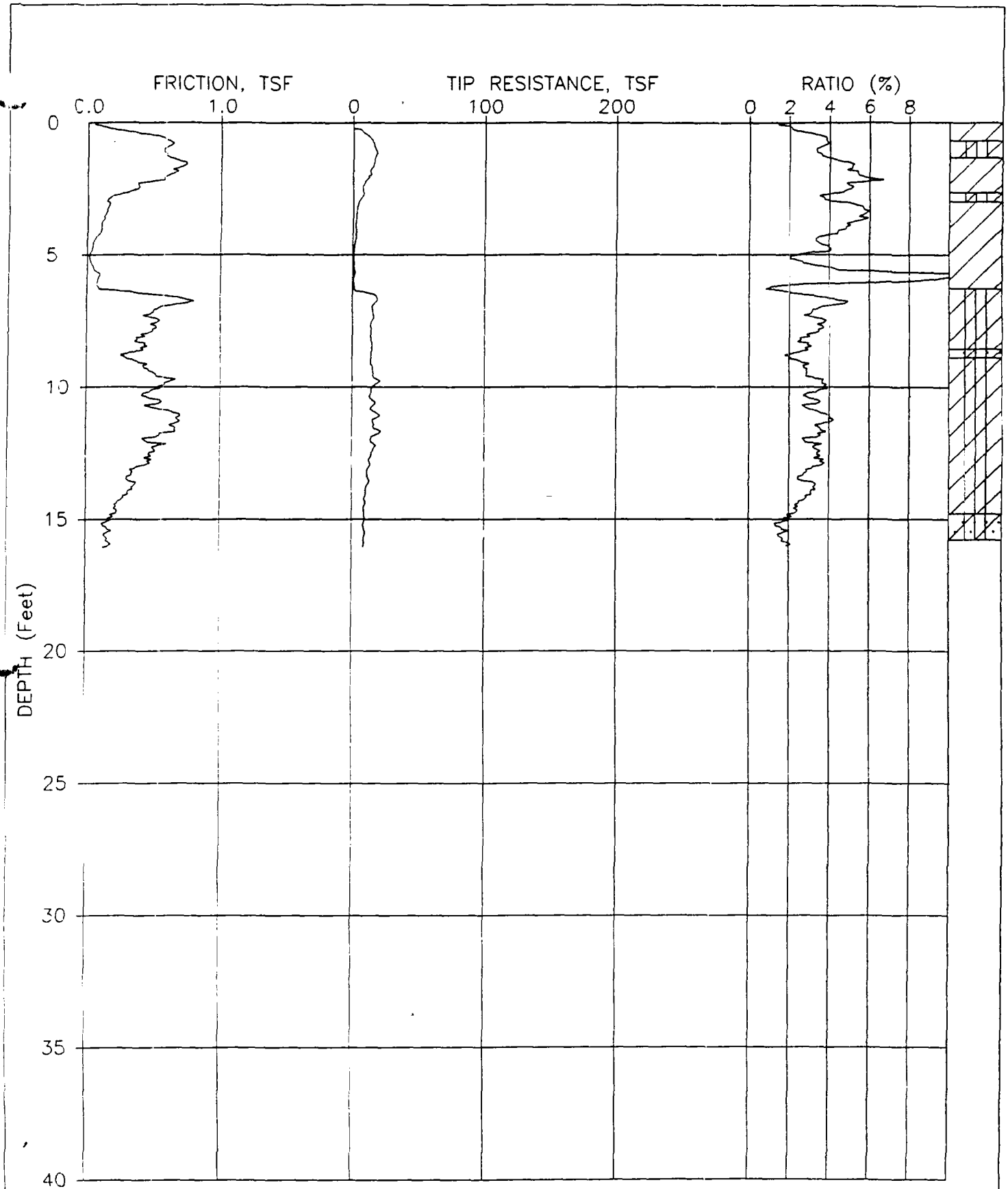
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 23 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

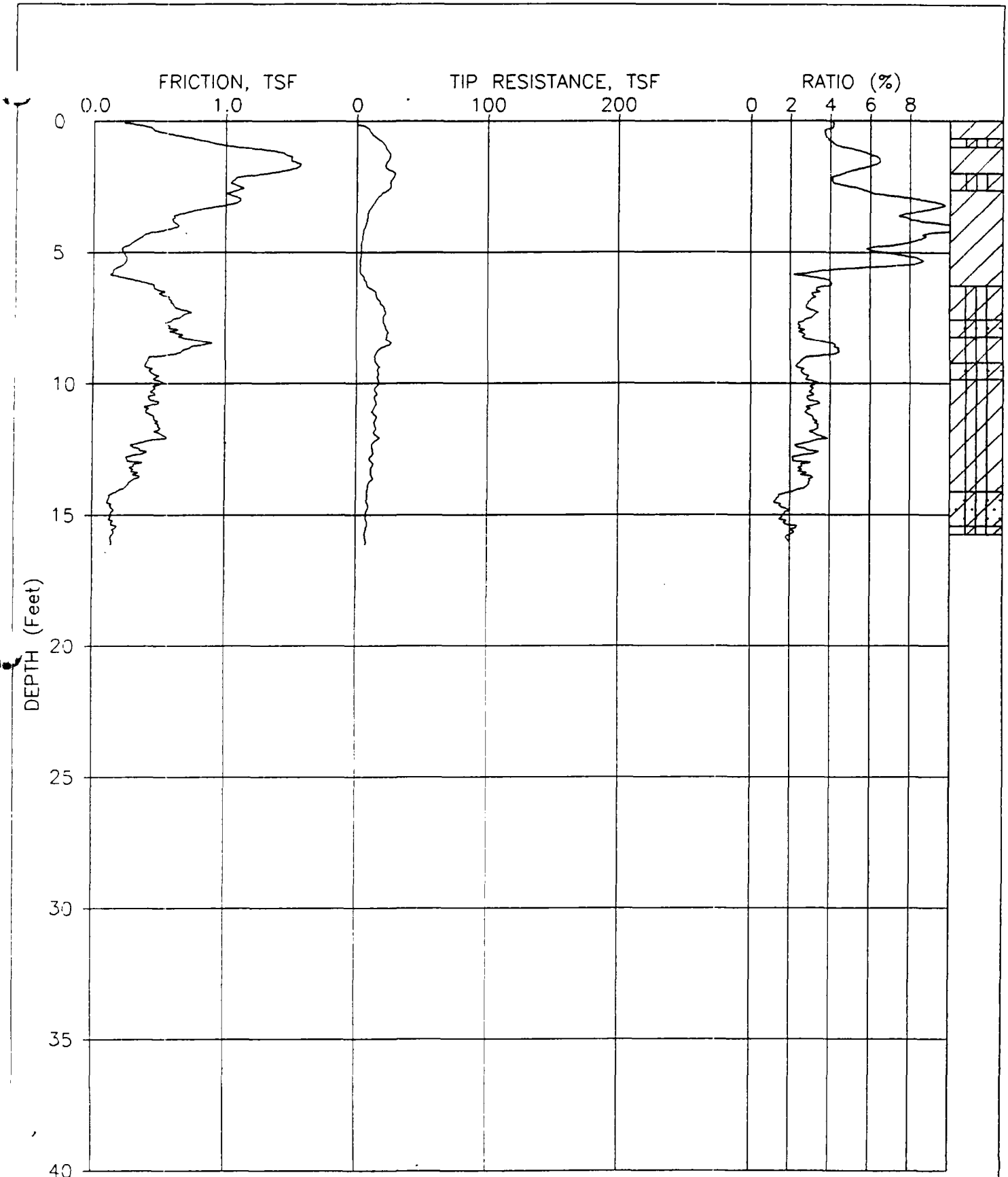
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 23A DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

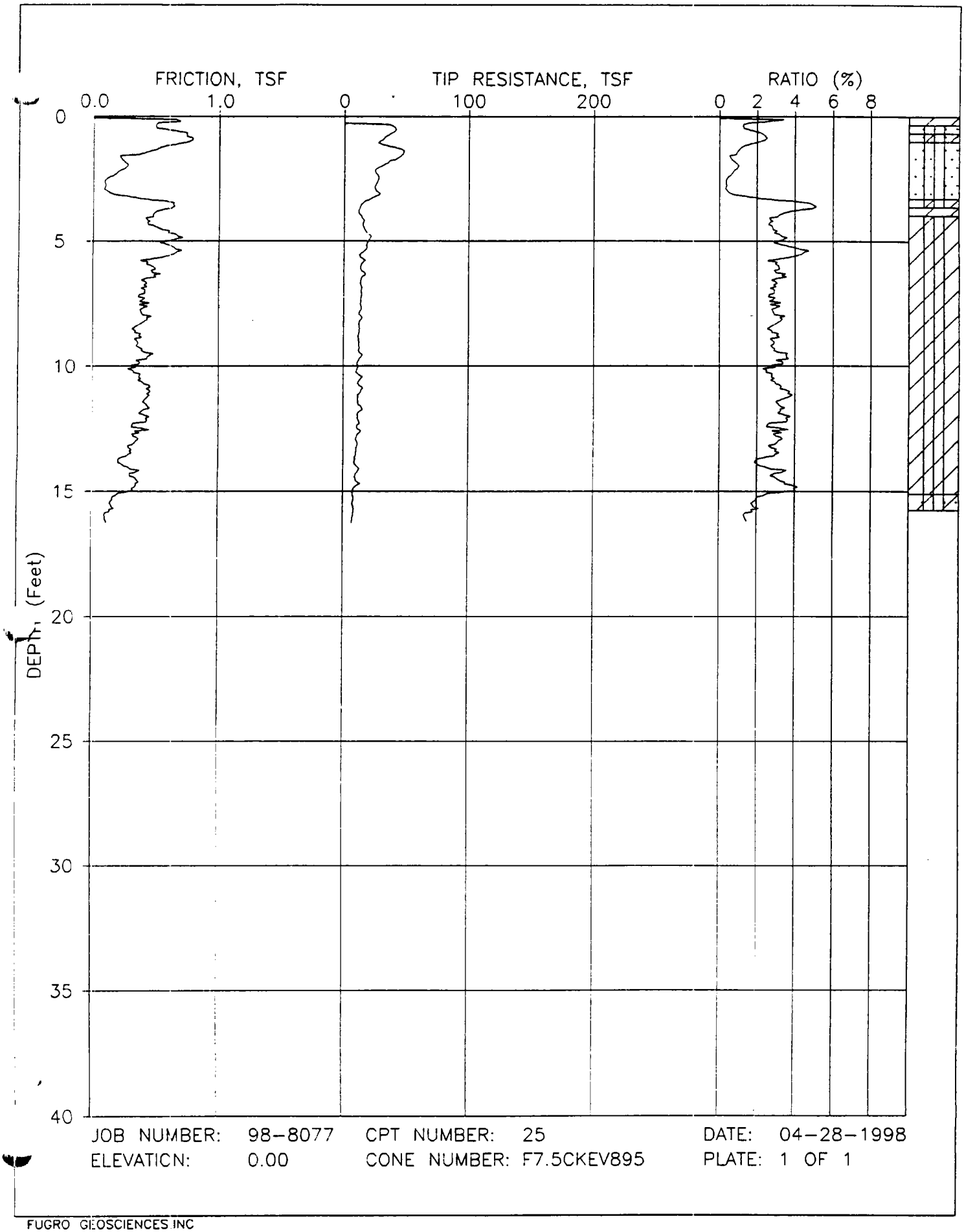
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 24 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

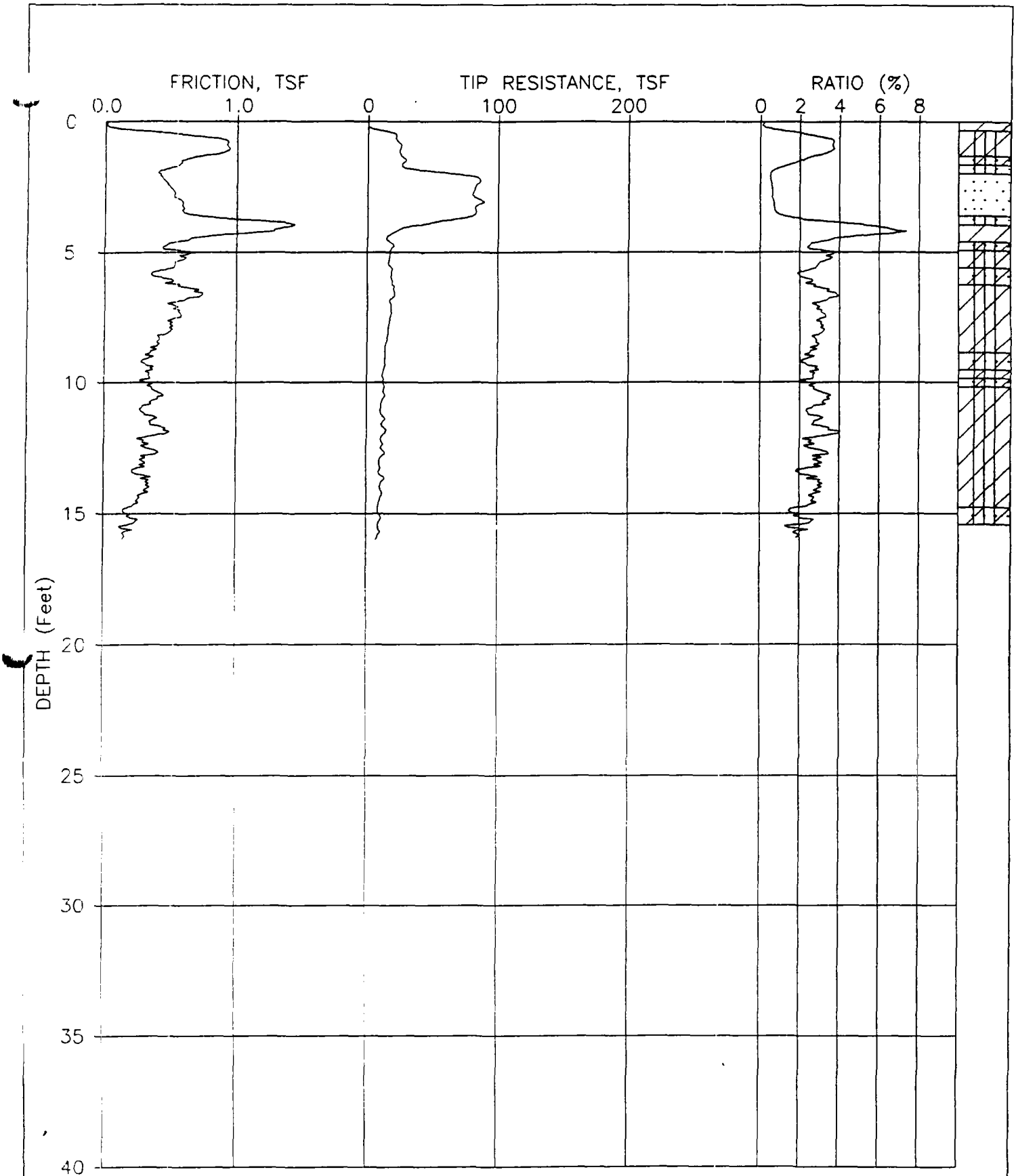
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 25 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

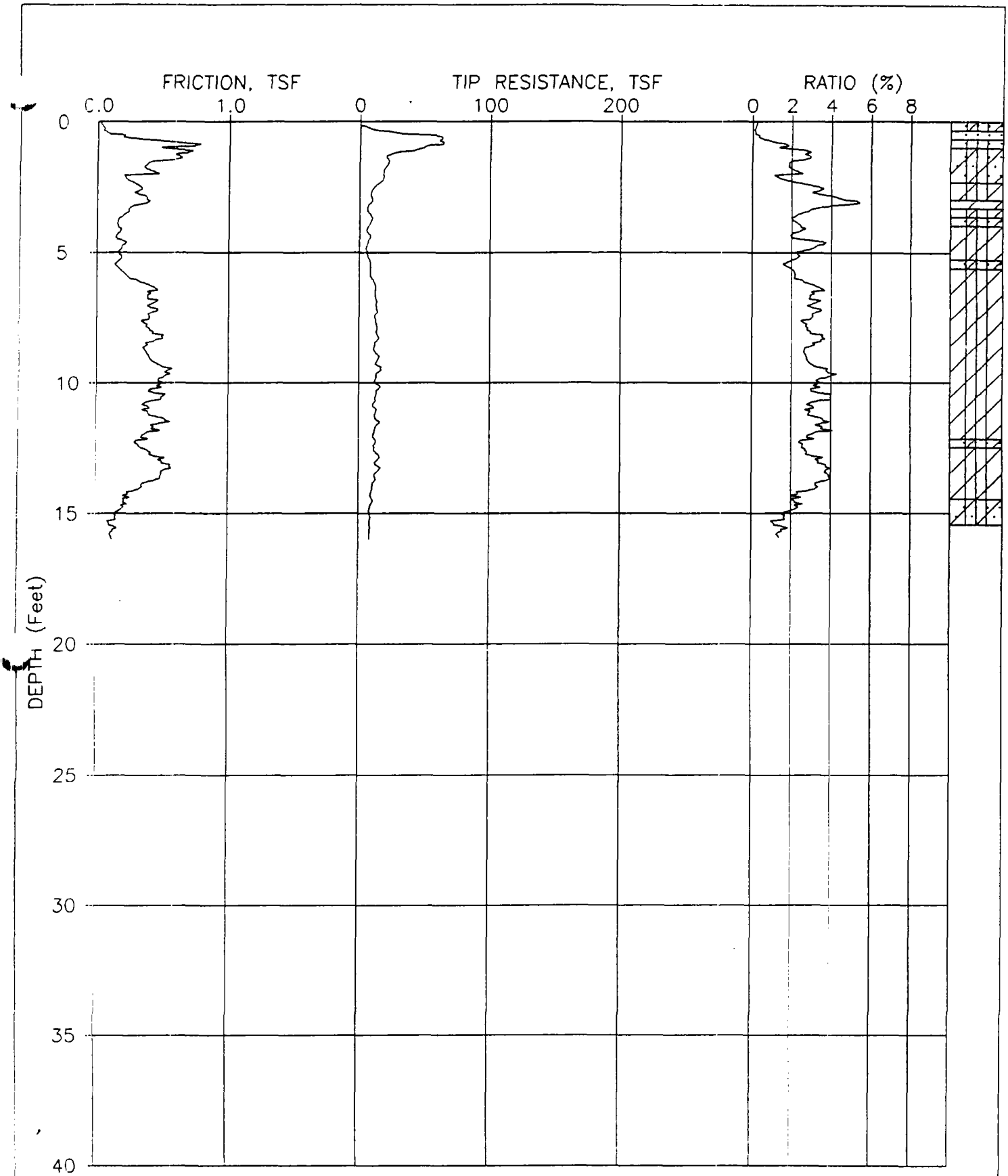
FUGRO GEOSCIENCES INC



JOB NUMBER: 98-8077 CPT NUMBER: 26 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

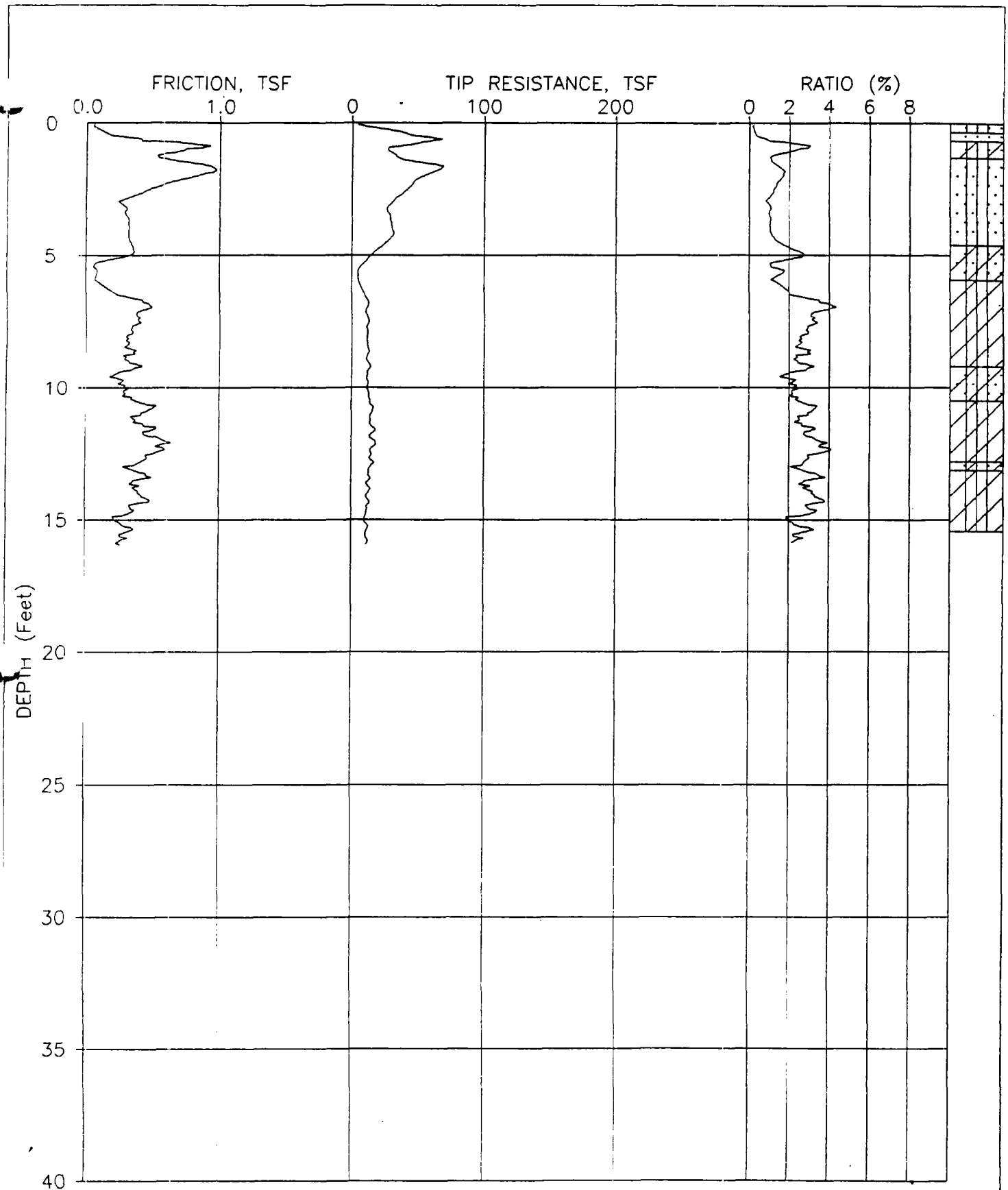
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 27 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

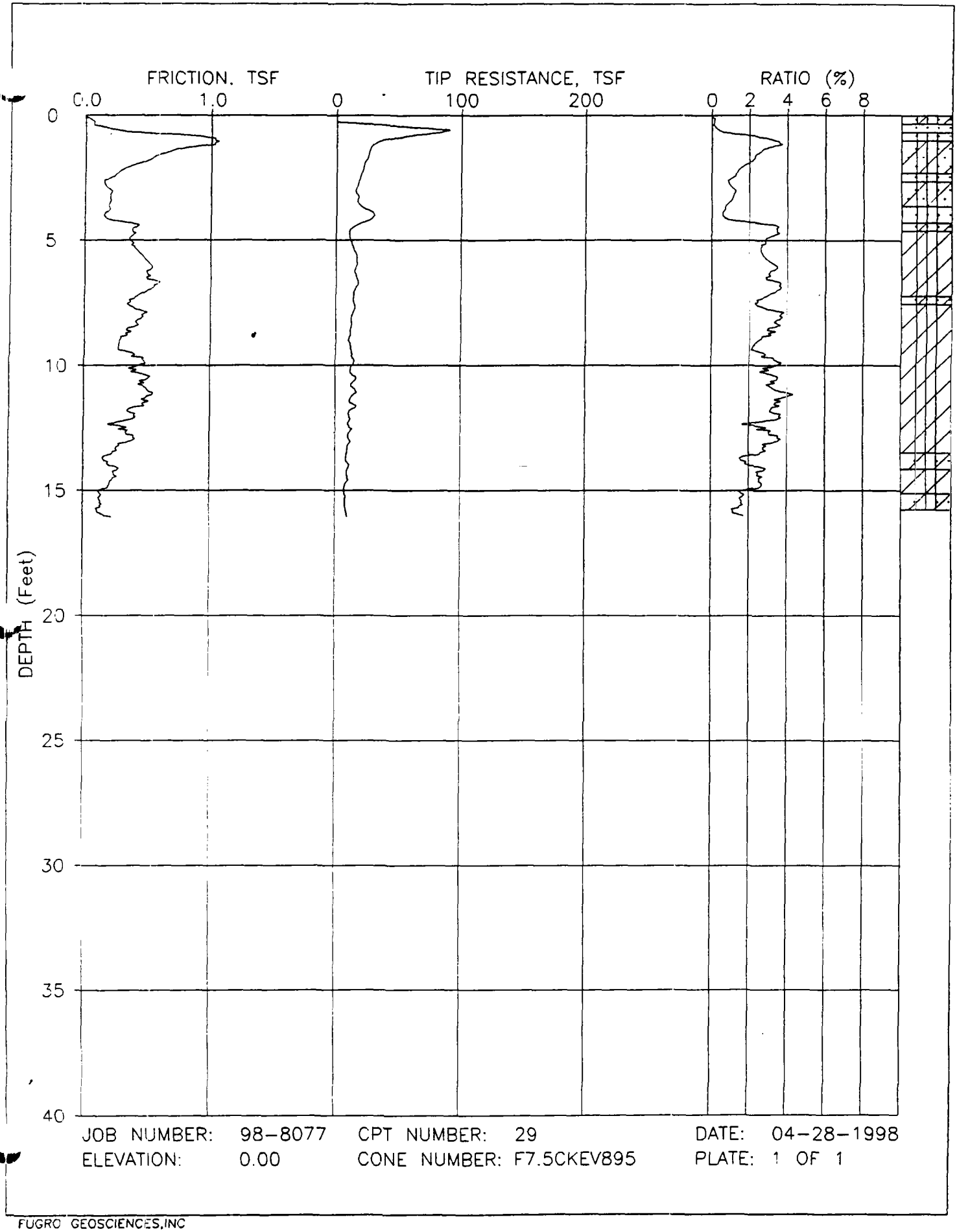
FUGRO GEOSCIENCES,INC



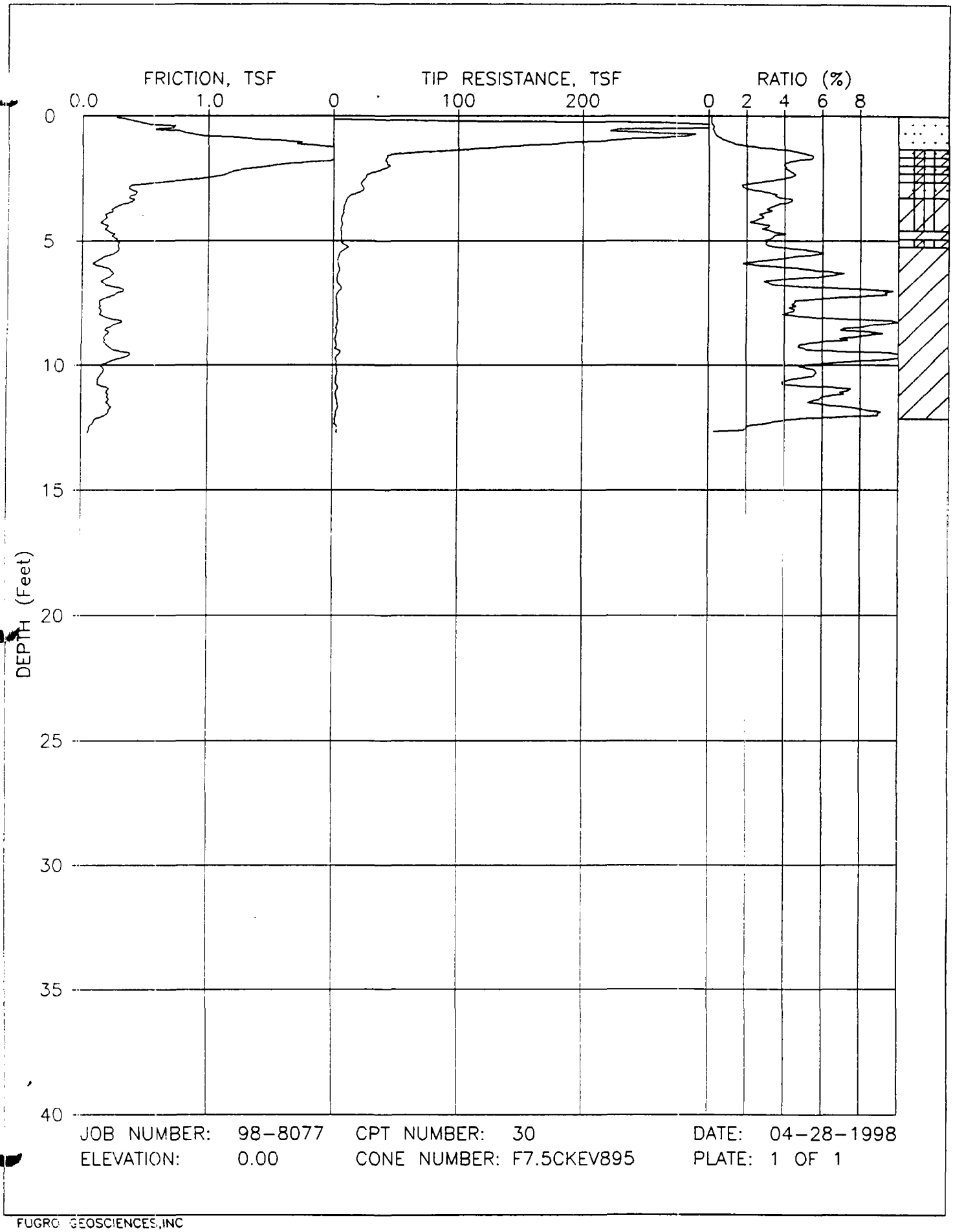
JOB NUMBER: 98-8077 CPT NUMBER: 28 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



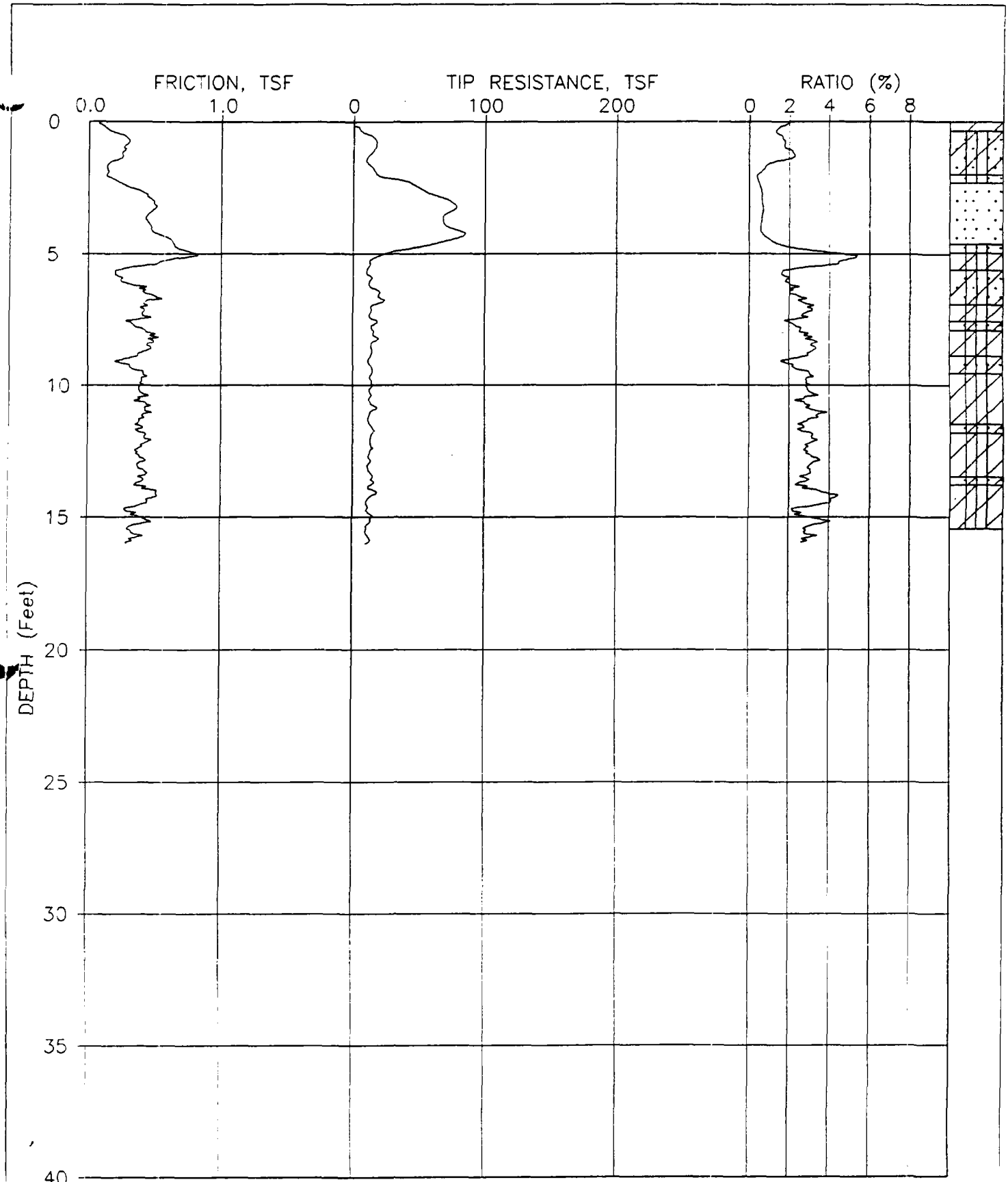
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 30 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

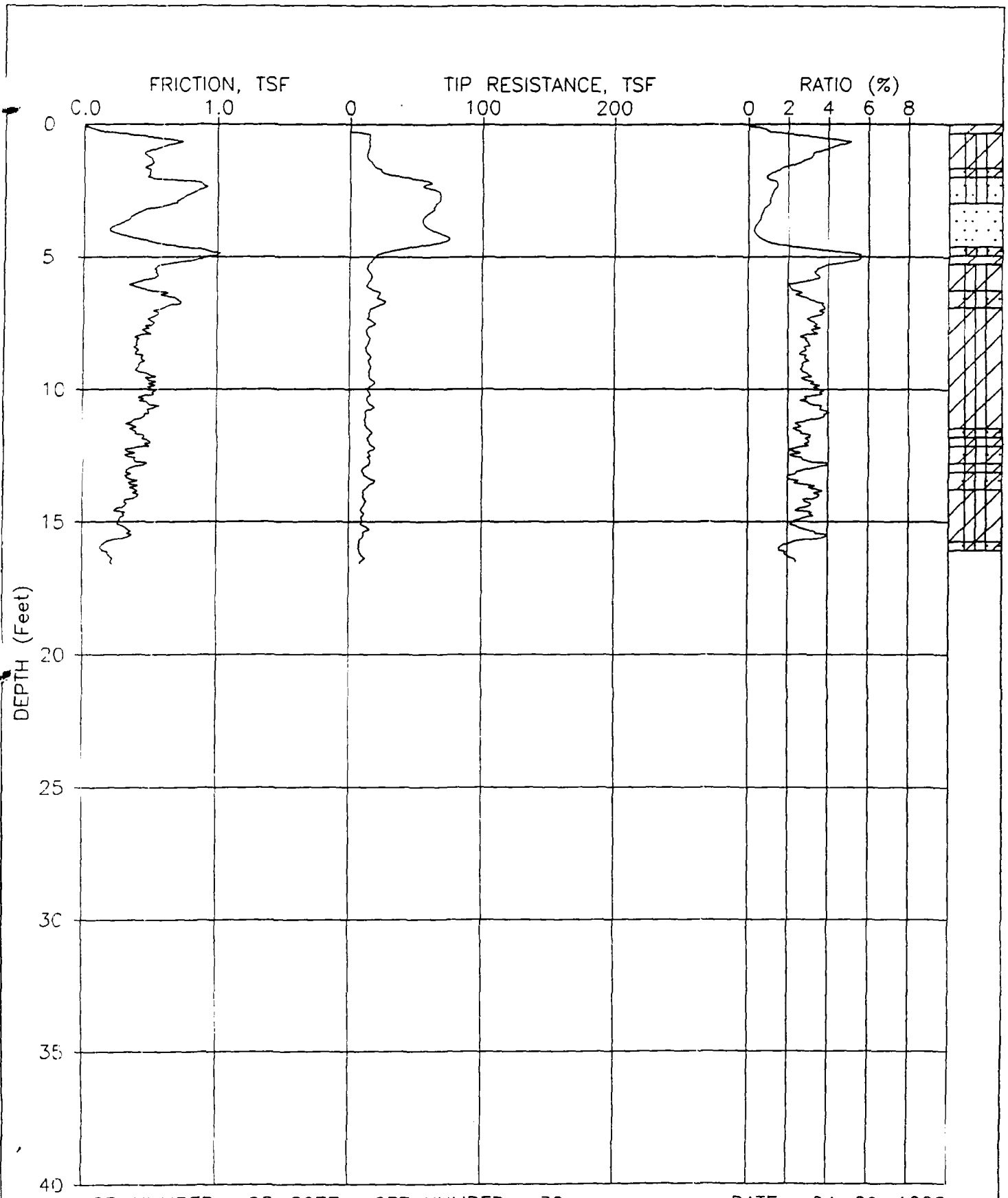
FUGRO GEOSCIENCES, INC



JOB NUMBER: 98-8077 CPT NUMBER: 31 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

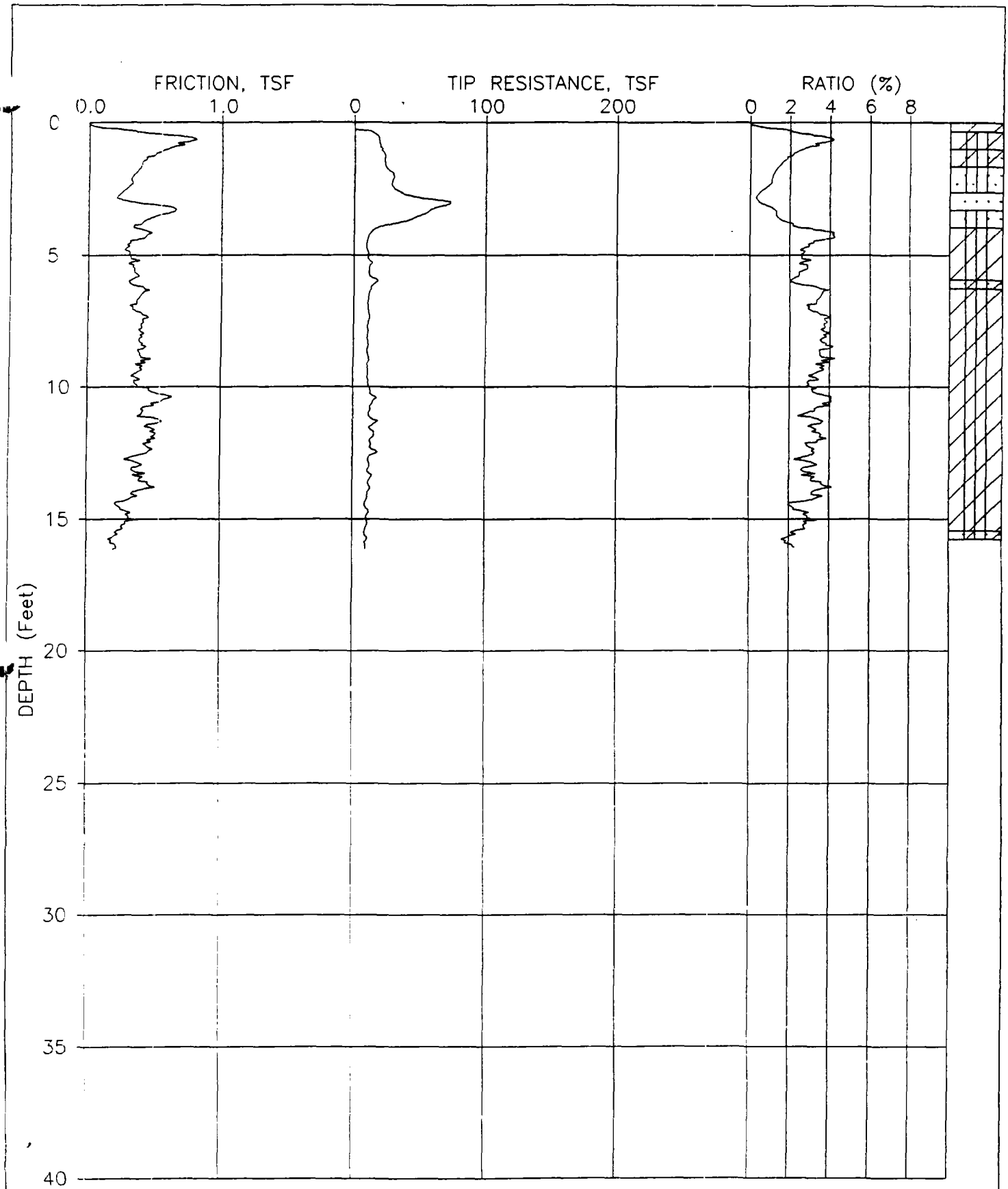
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 32 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

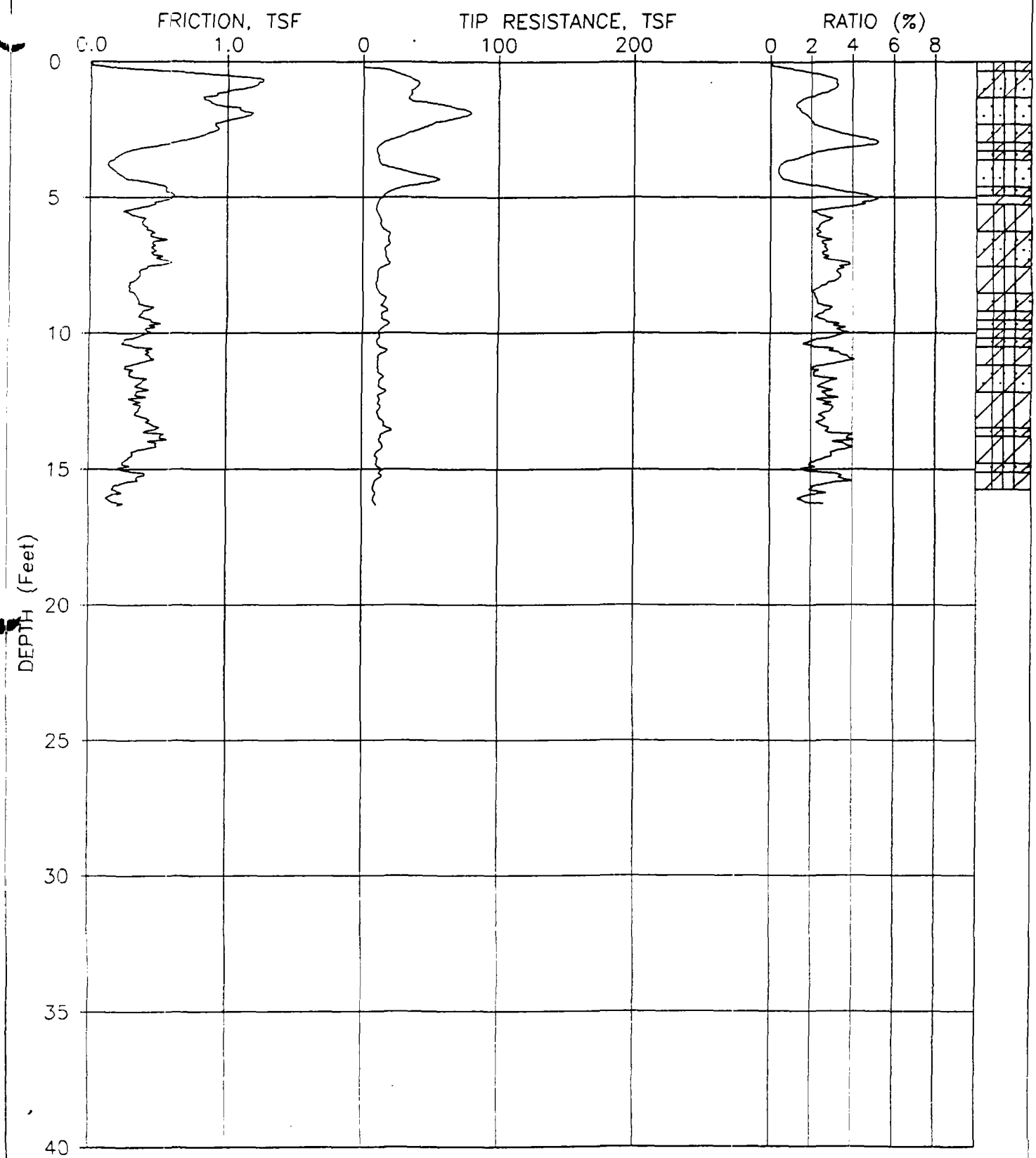
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 33 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

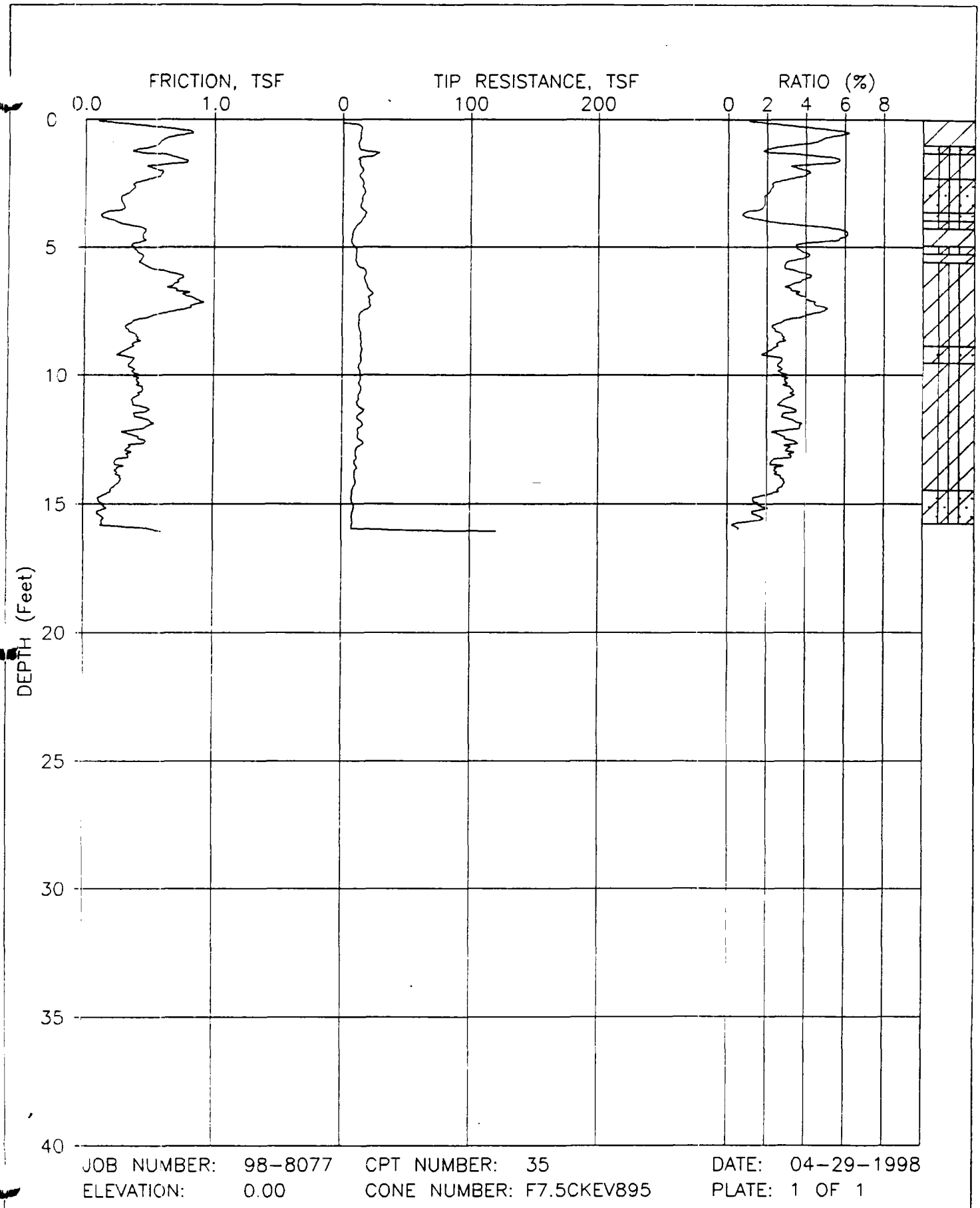
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 34 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

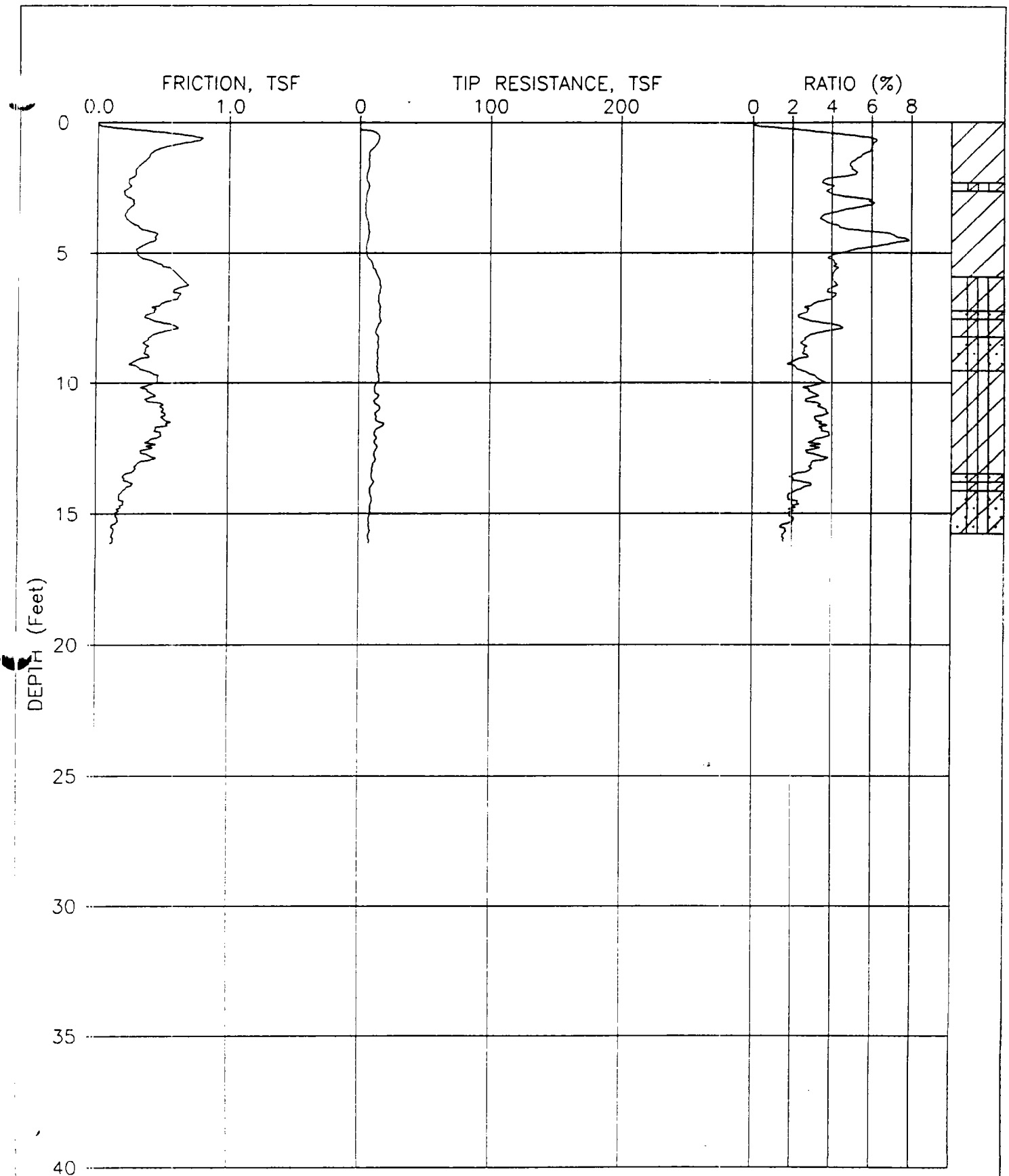
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 35 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

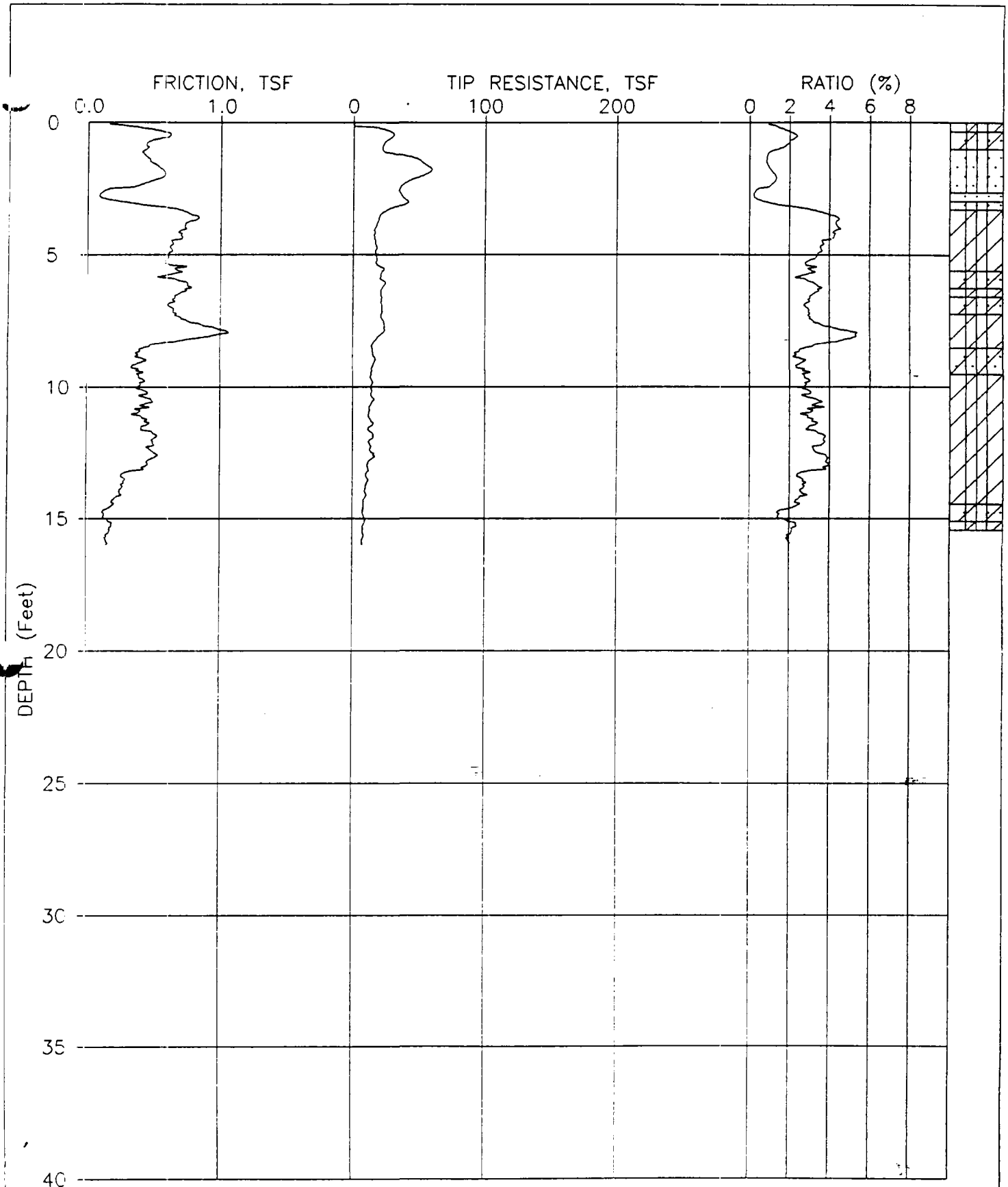
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 36 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

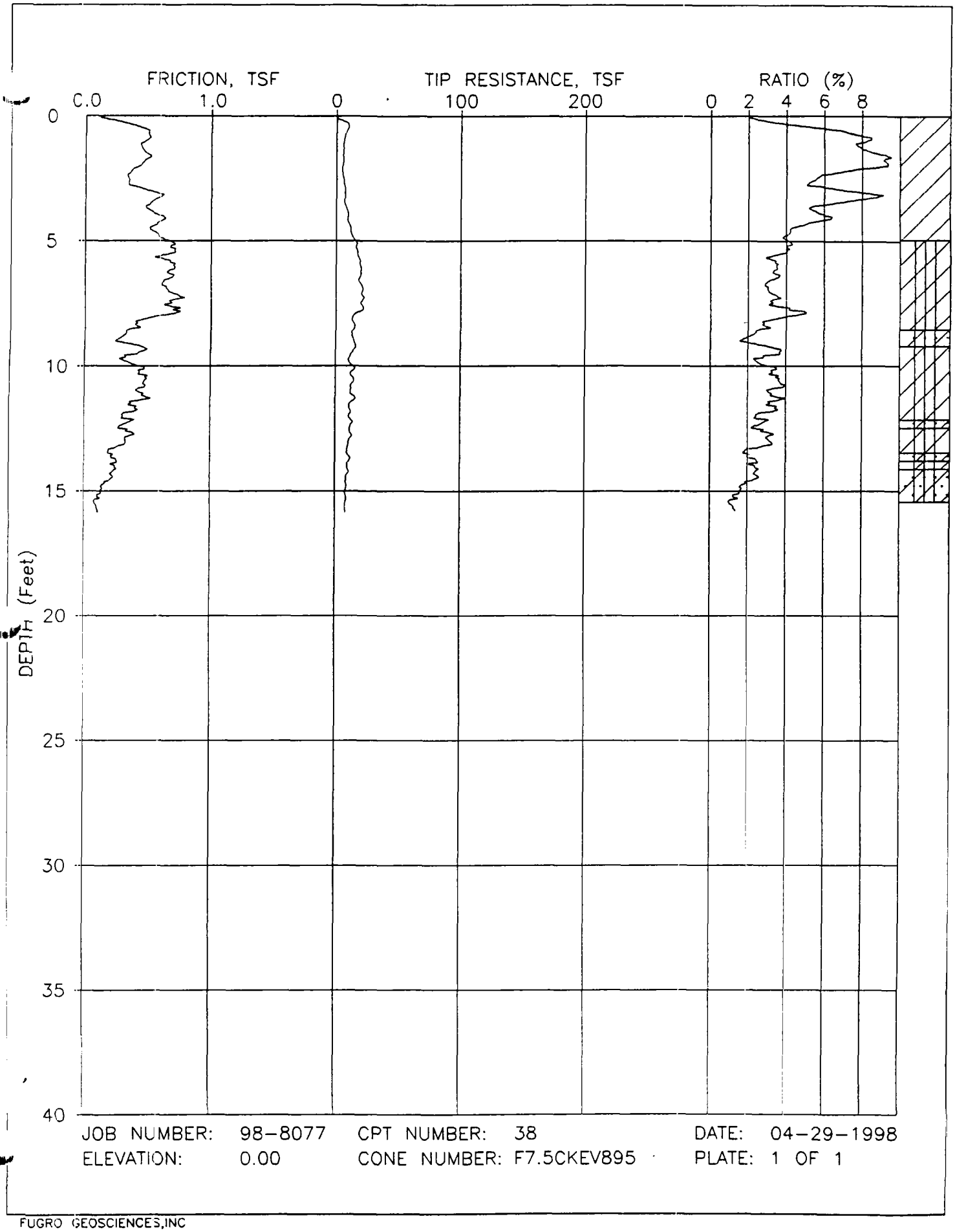
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 37 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

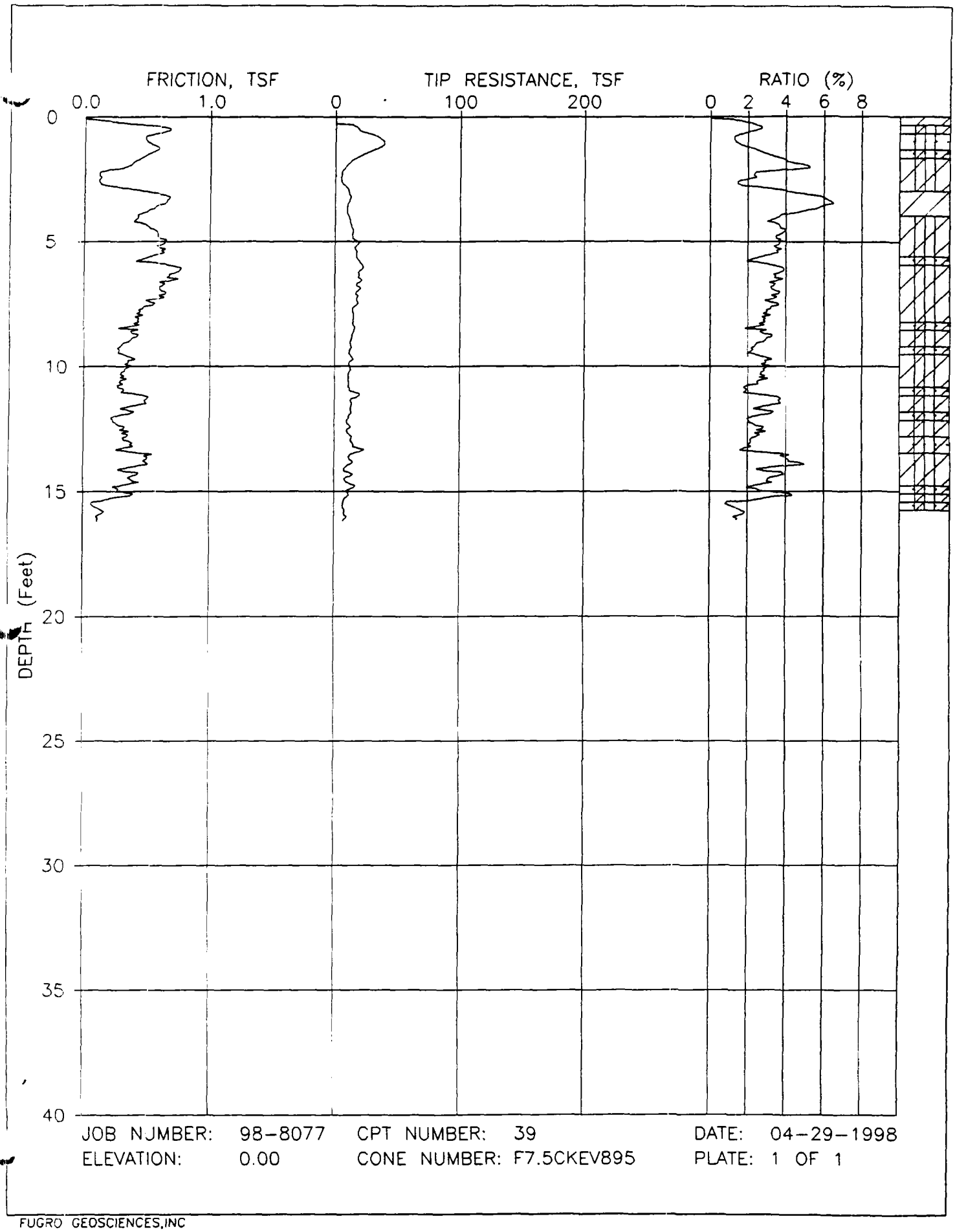
FUGRO GEOSCIENCES,INC



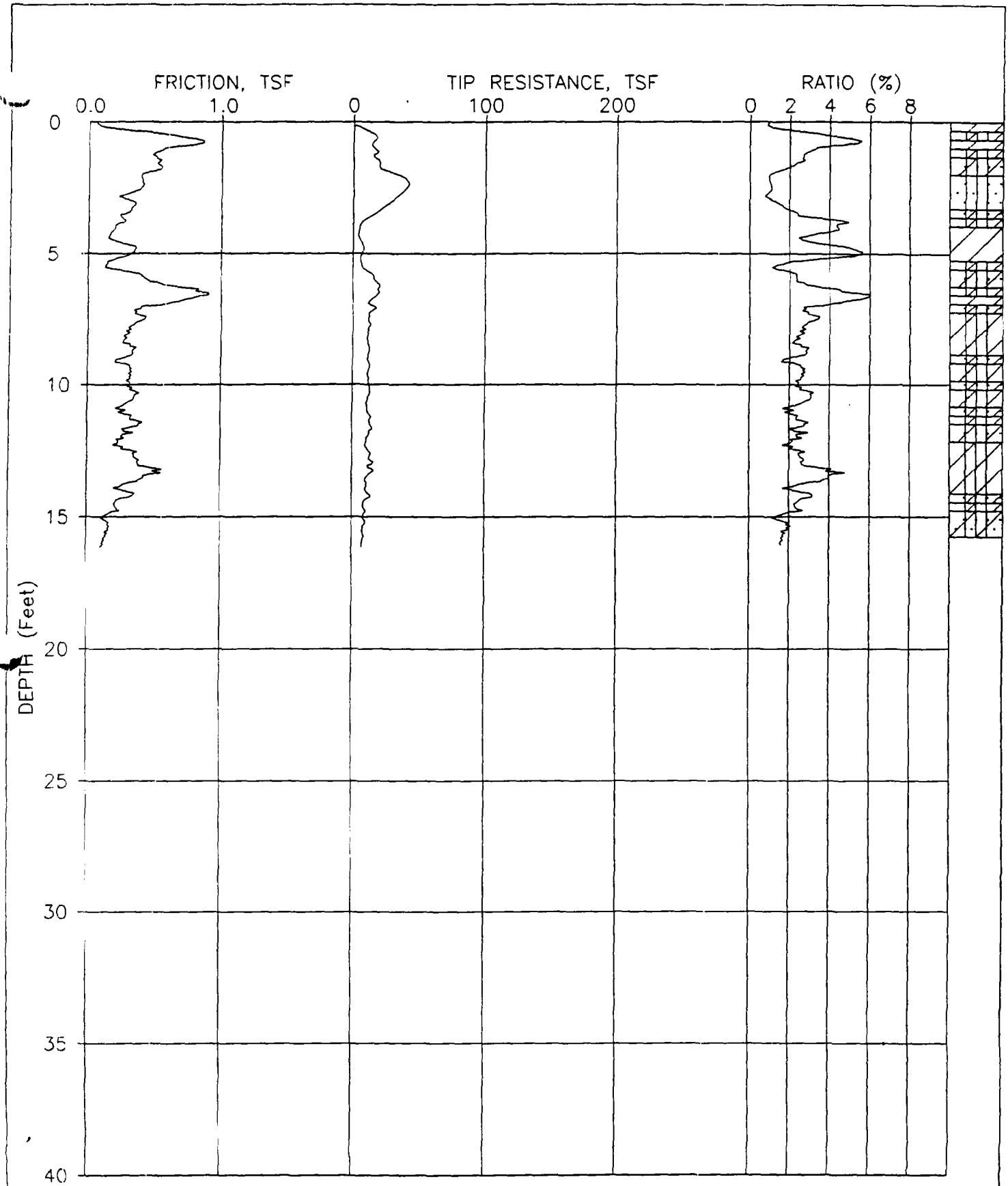
JOB NUMBER: 98-8077 CPT NUMBER: 38 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



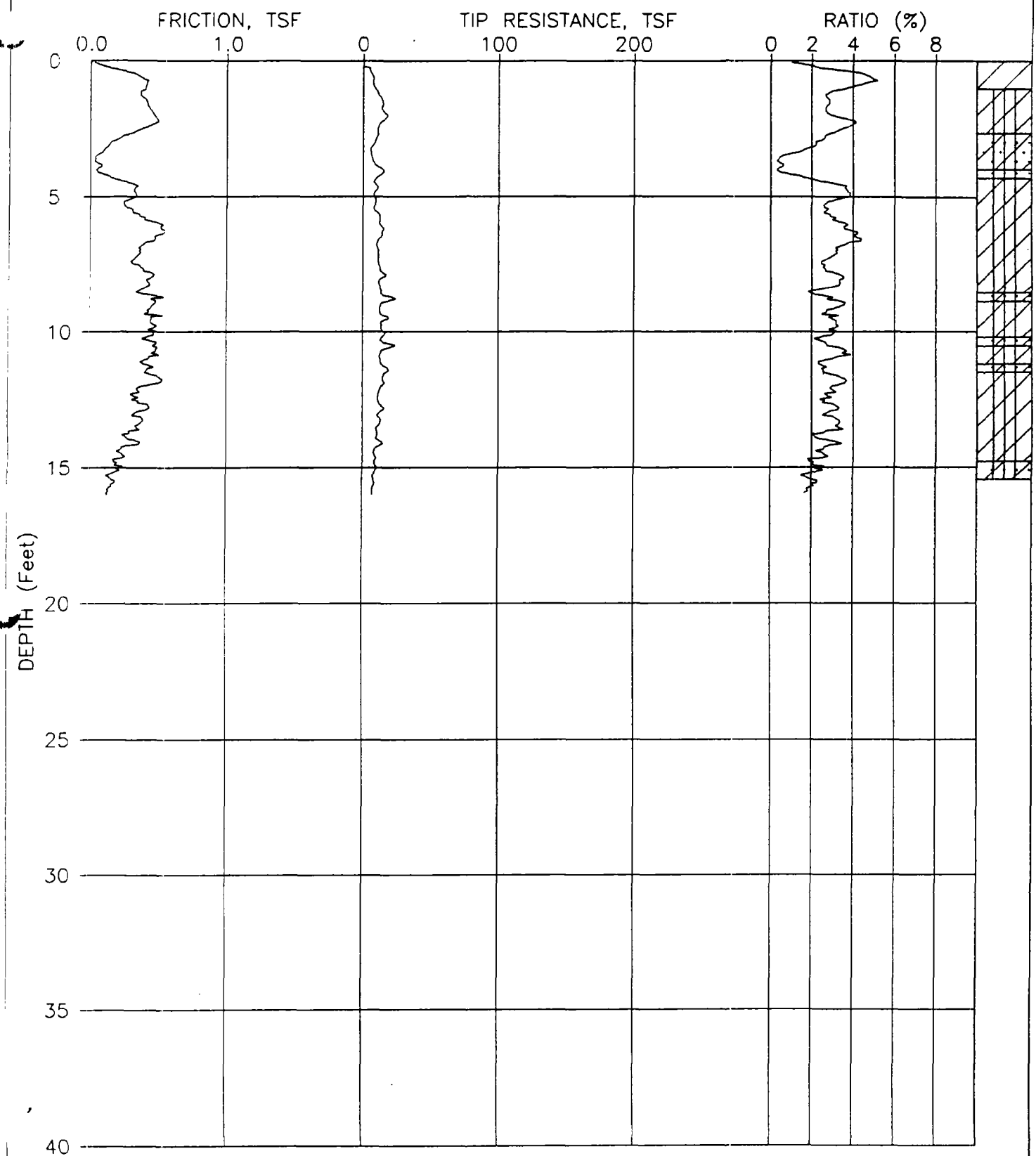
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 40 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

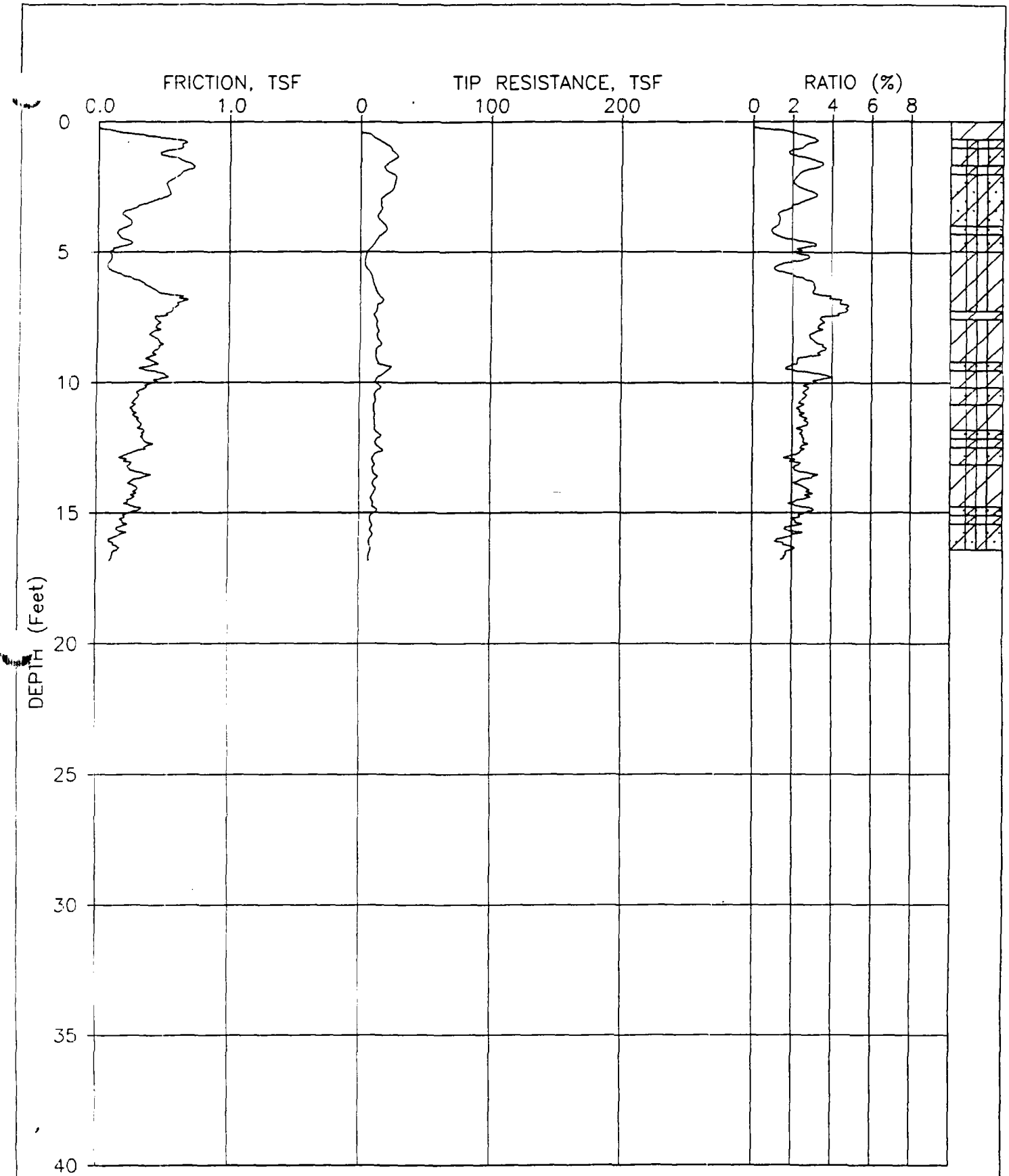
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 41 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

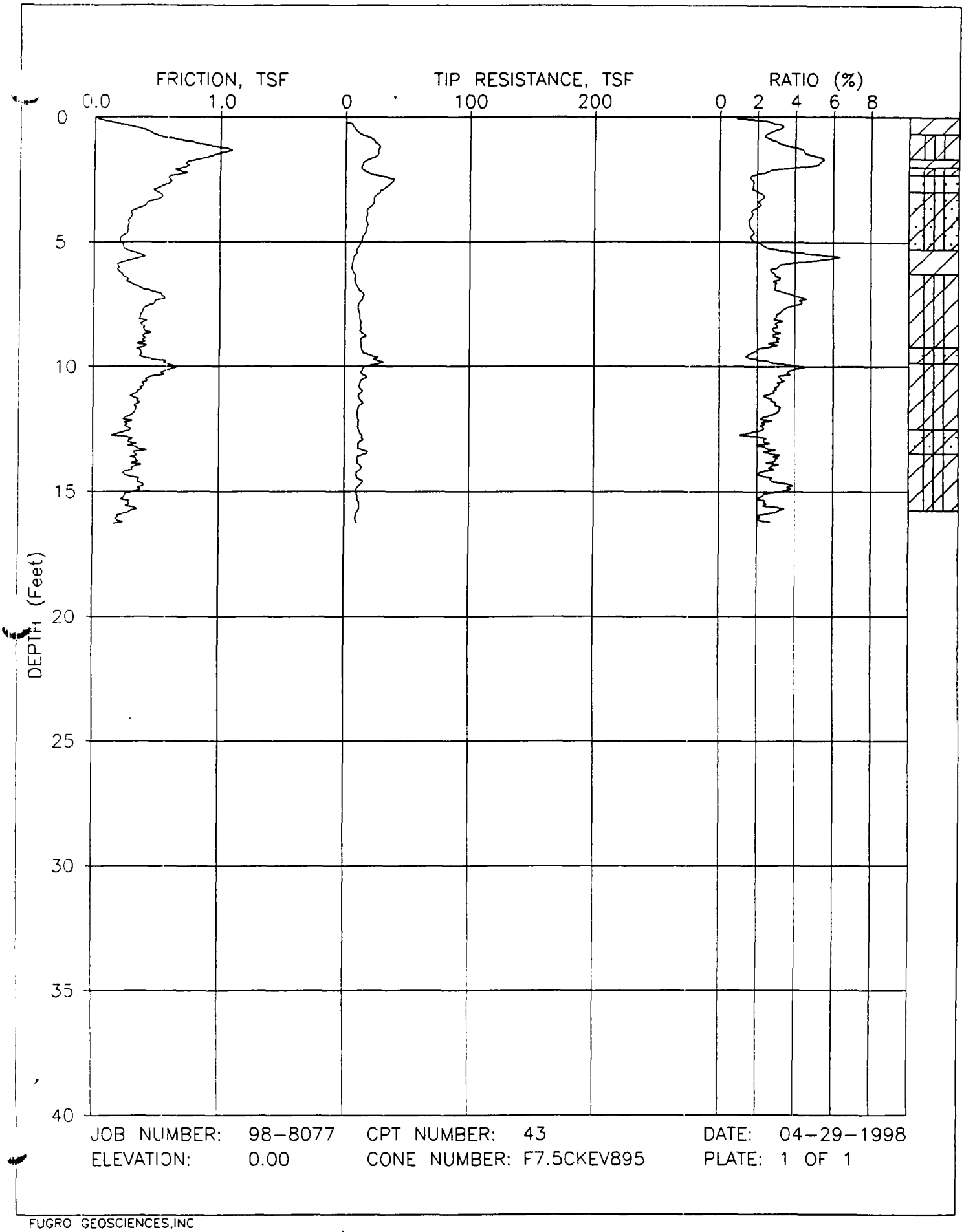
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 42 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

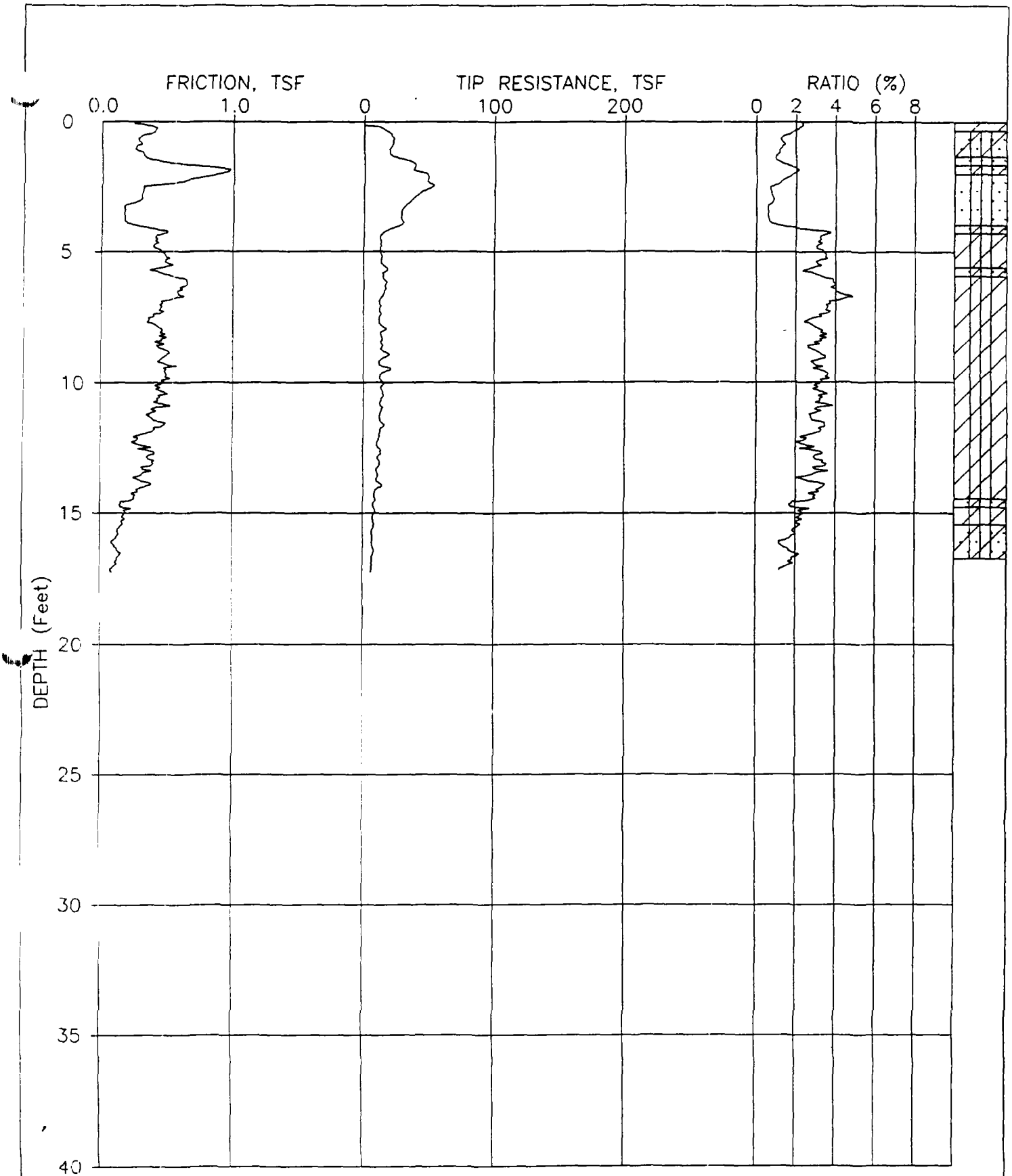
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 43 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

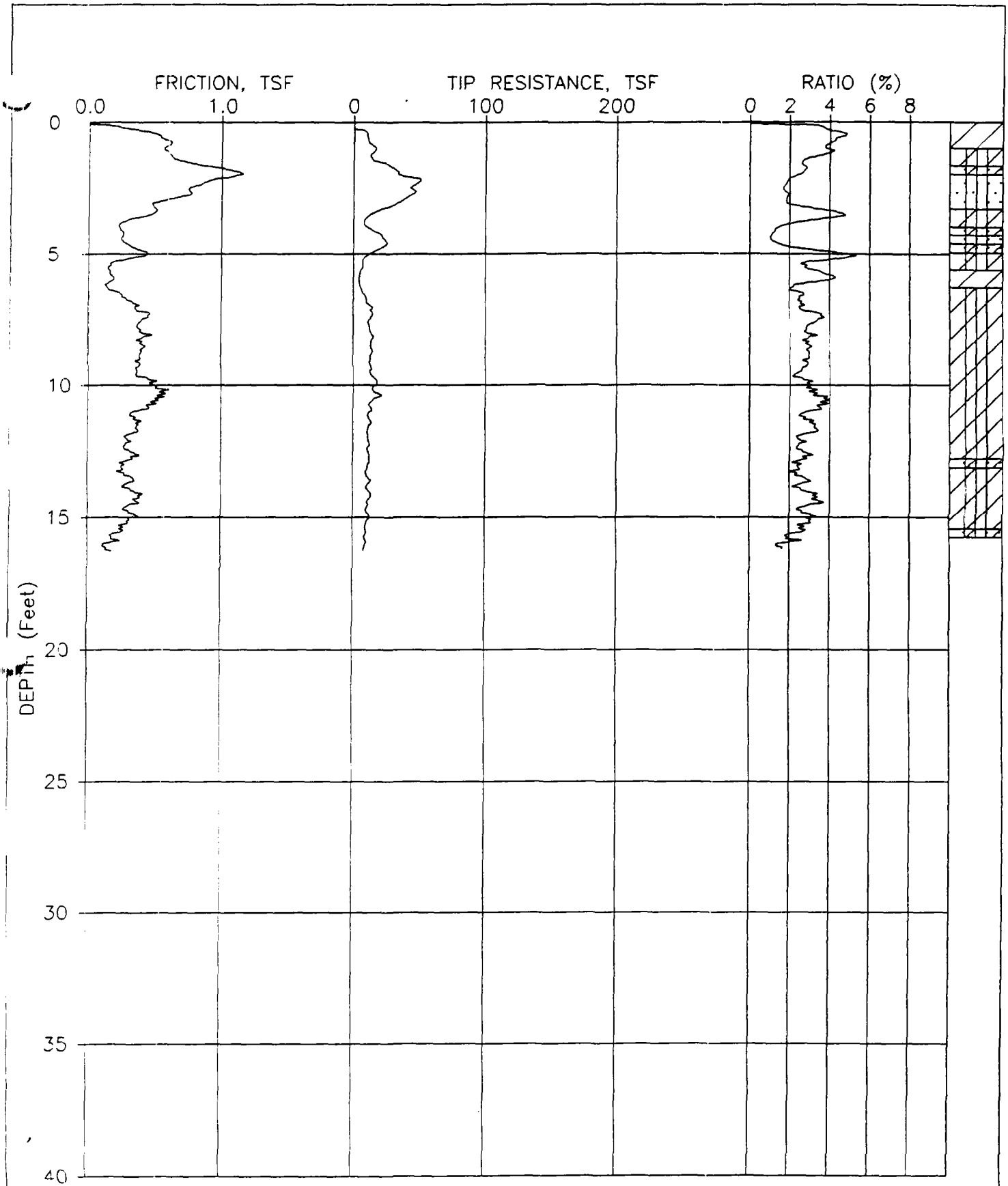
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 44 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

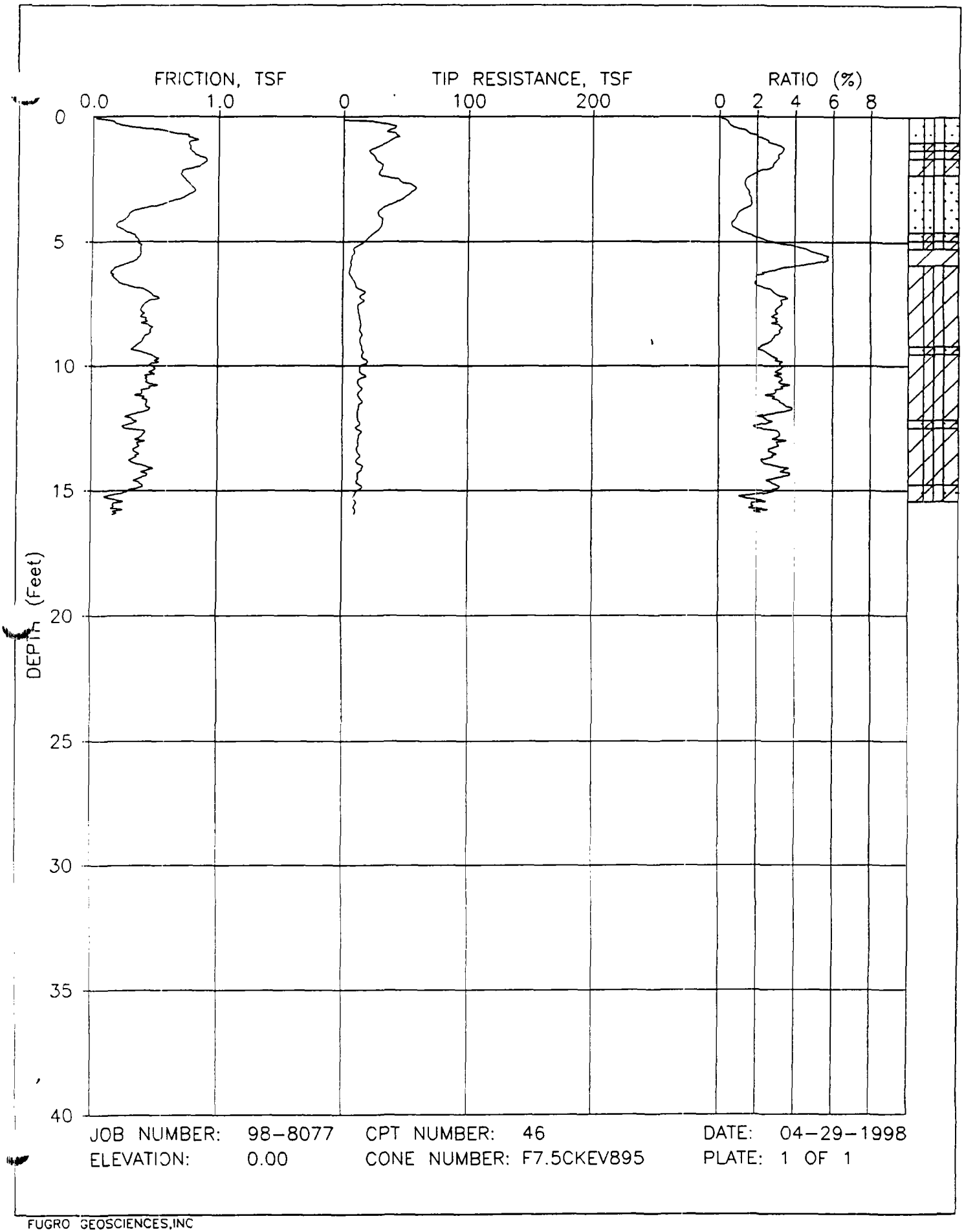
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 45 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

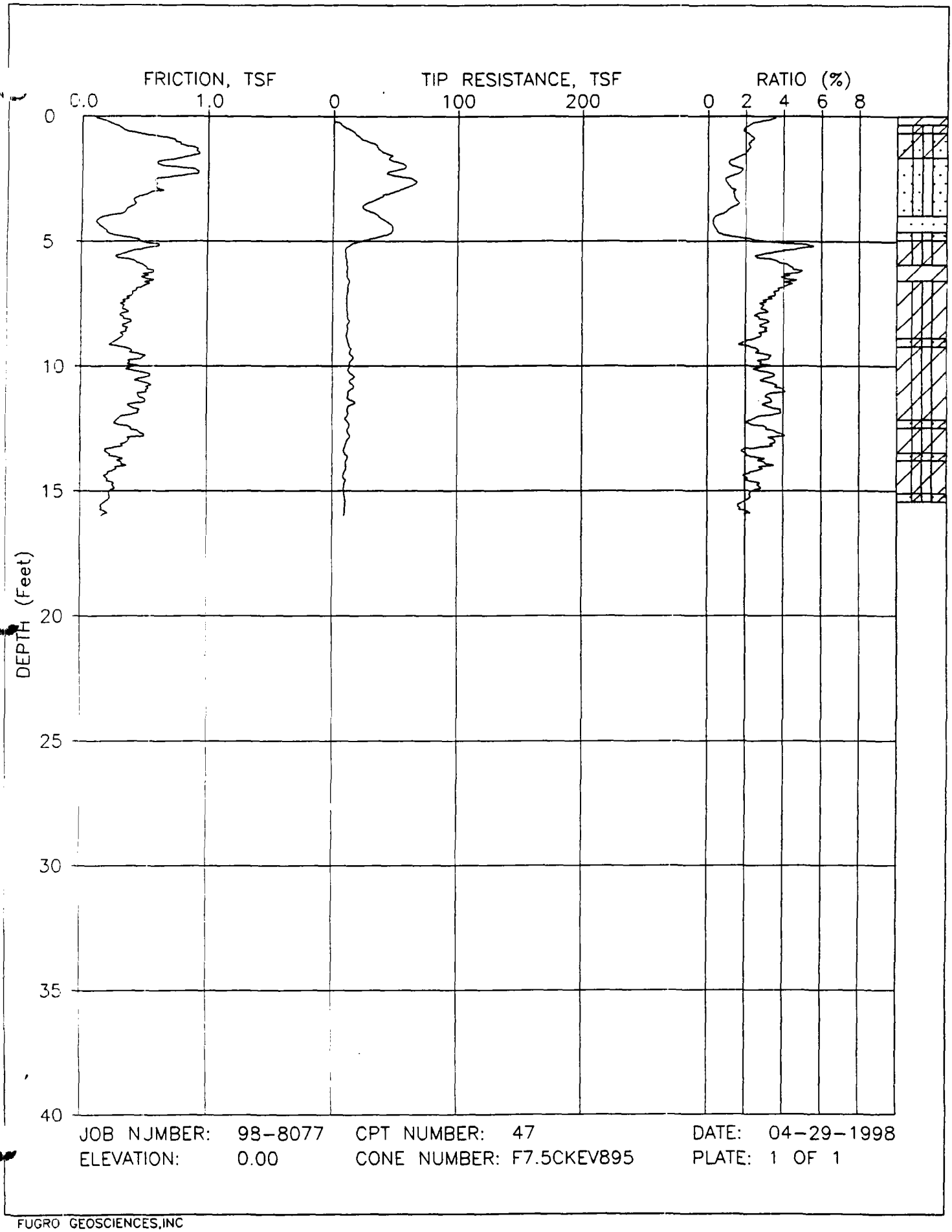
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 46 DATE: 04-29-1998

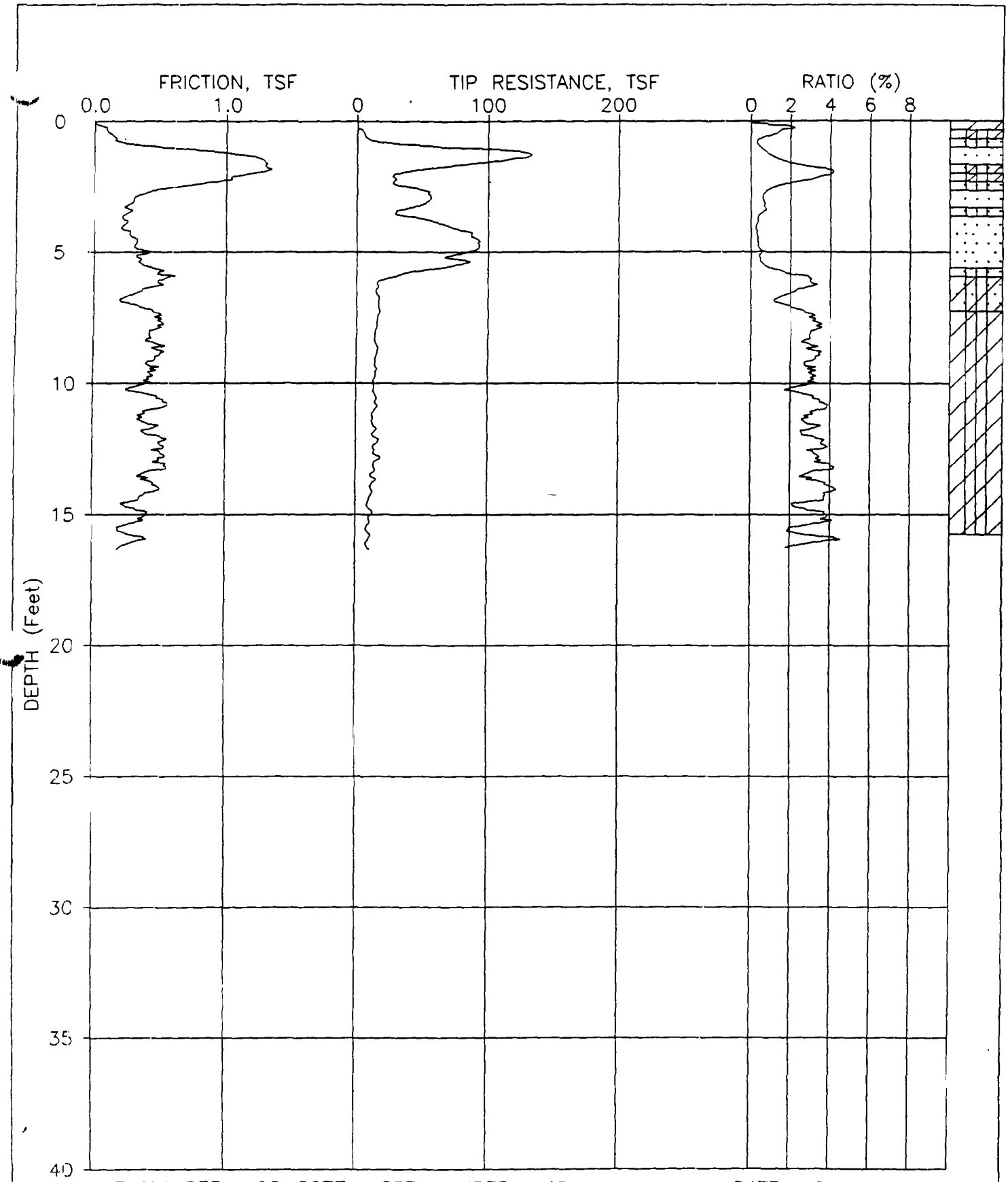
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NJMBER: 98-8077 CPT NUMBER: 47 DATE: 04-29-1998
ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

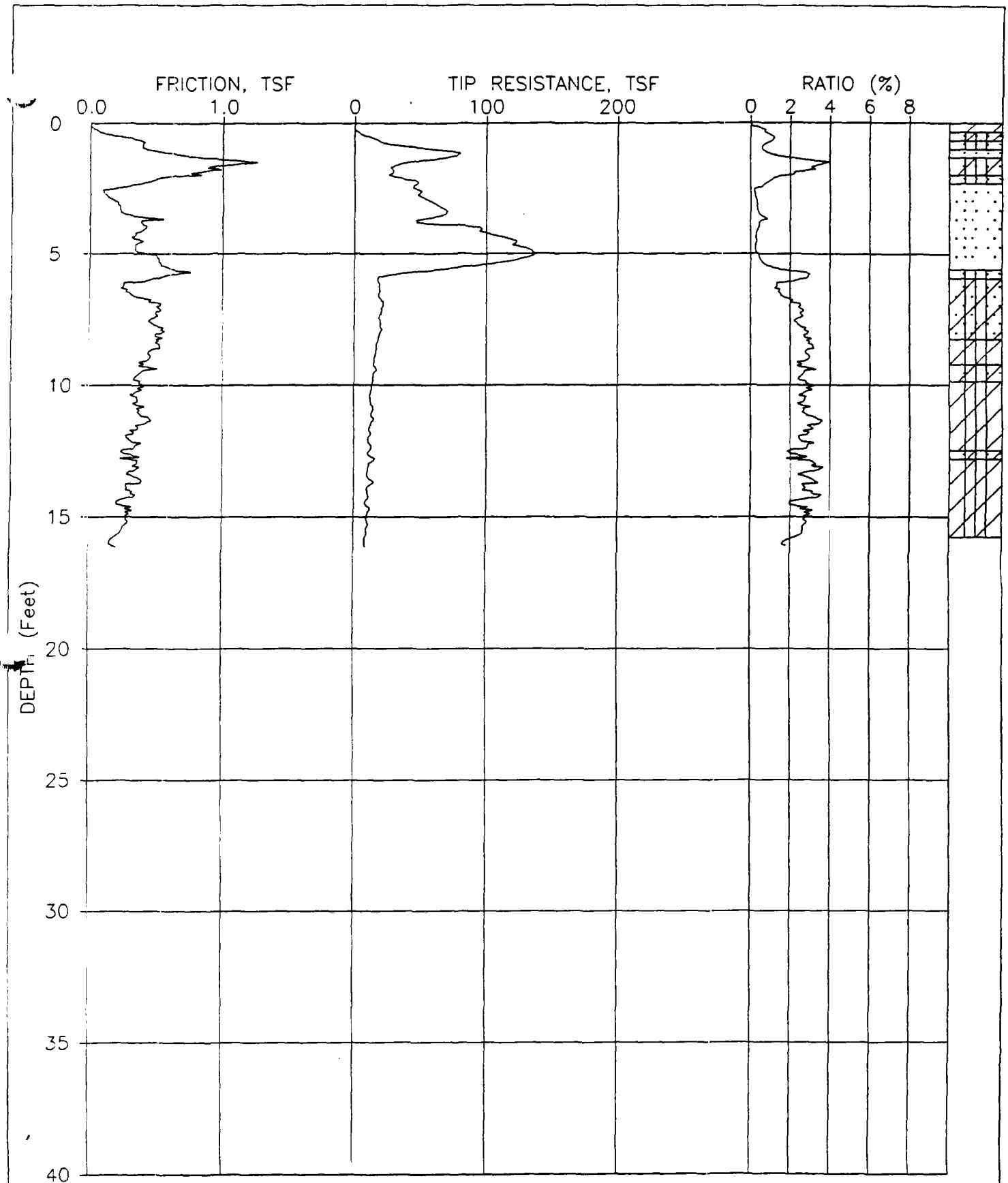
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 48 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

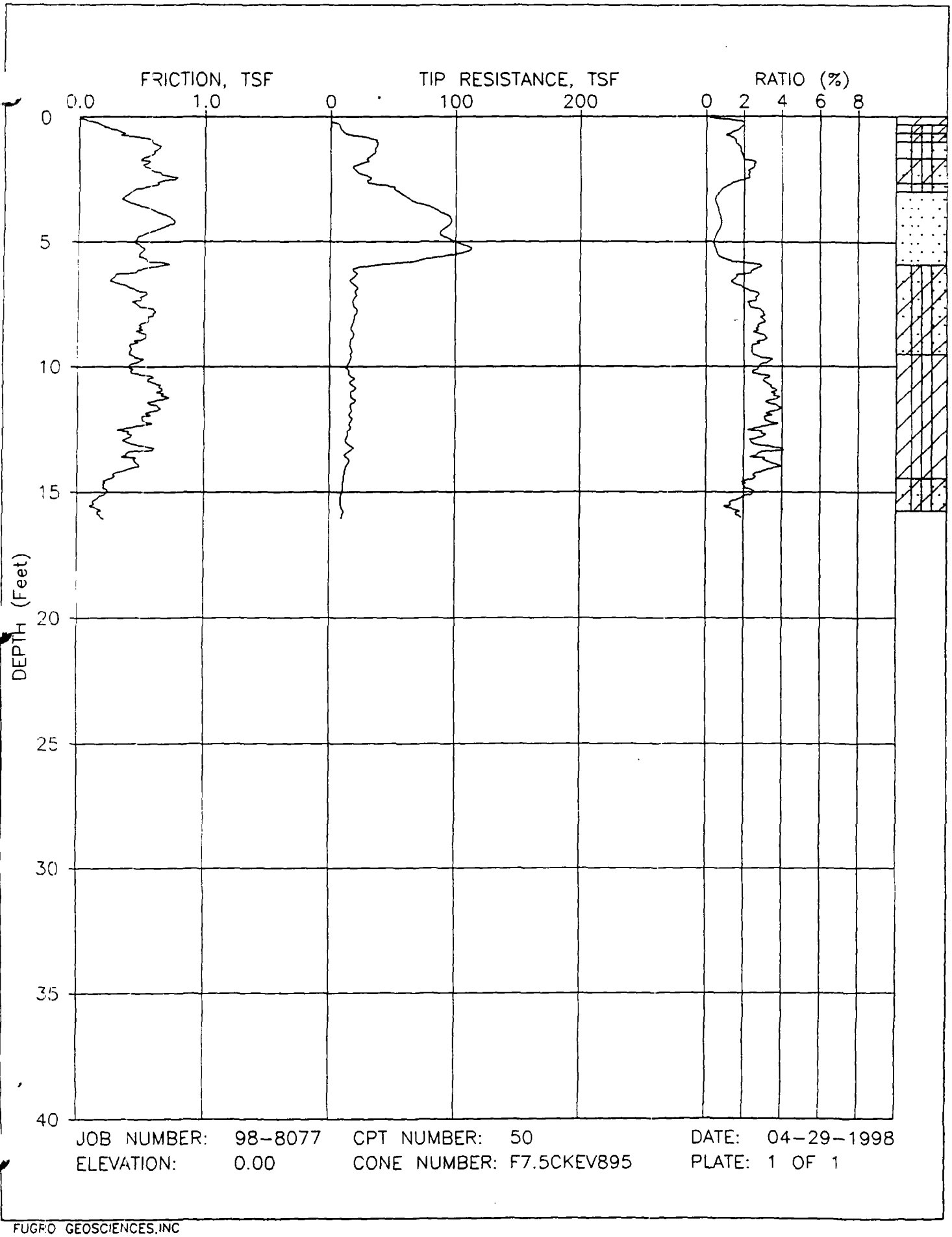
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 49 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

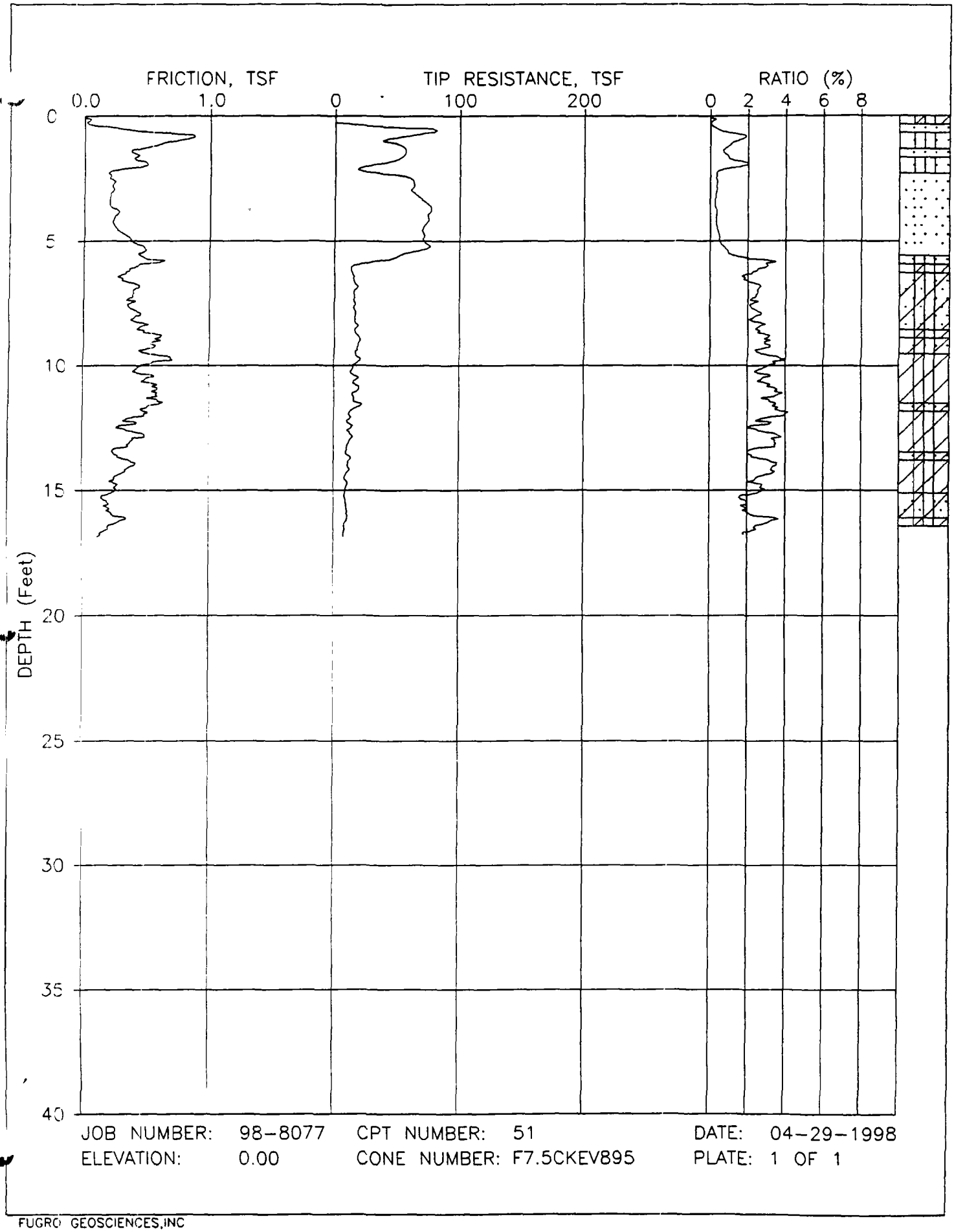
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 50 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

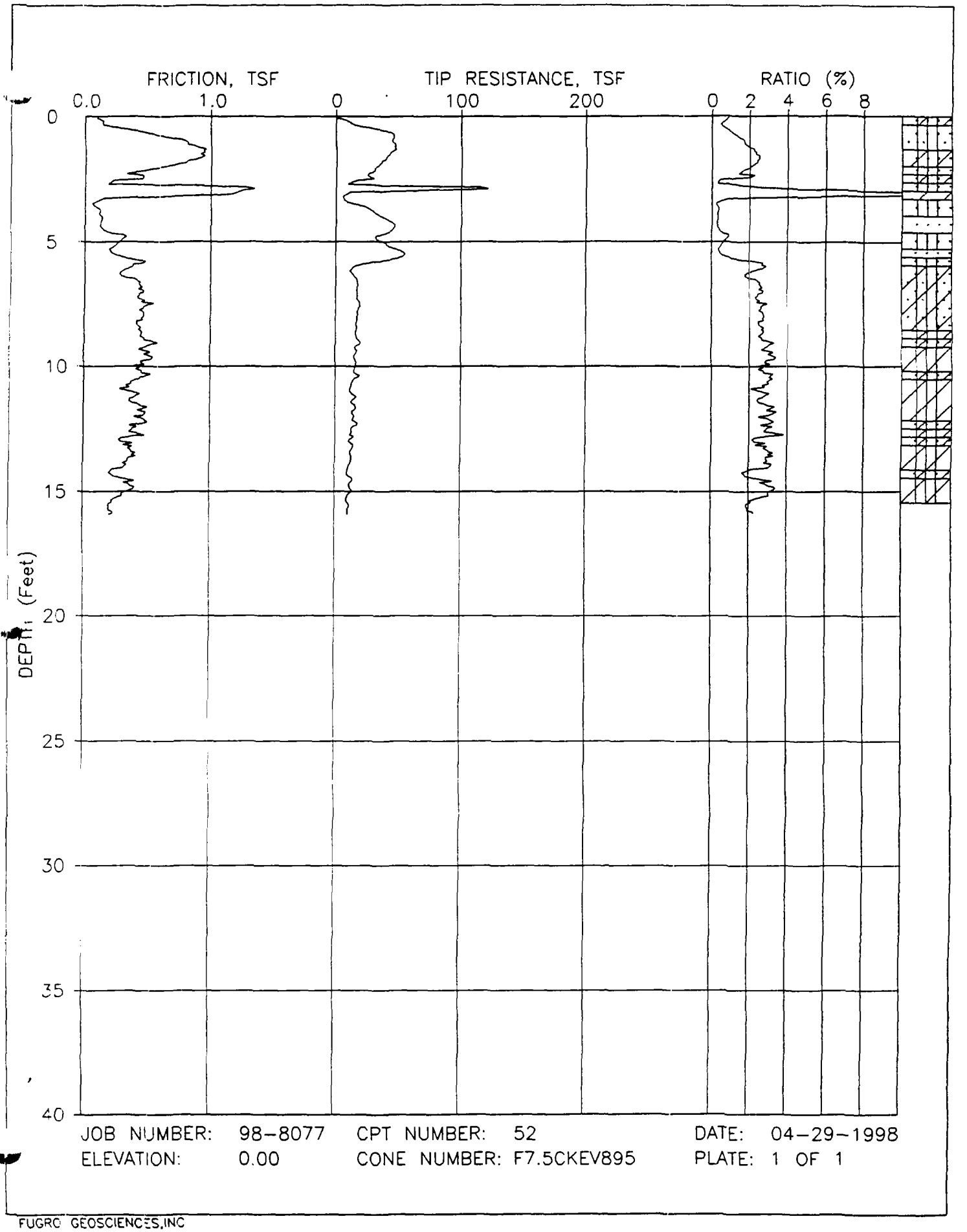
FUGRO GEOSCIENCES,INC



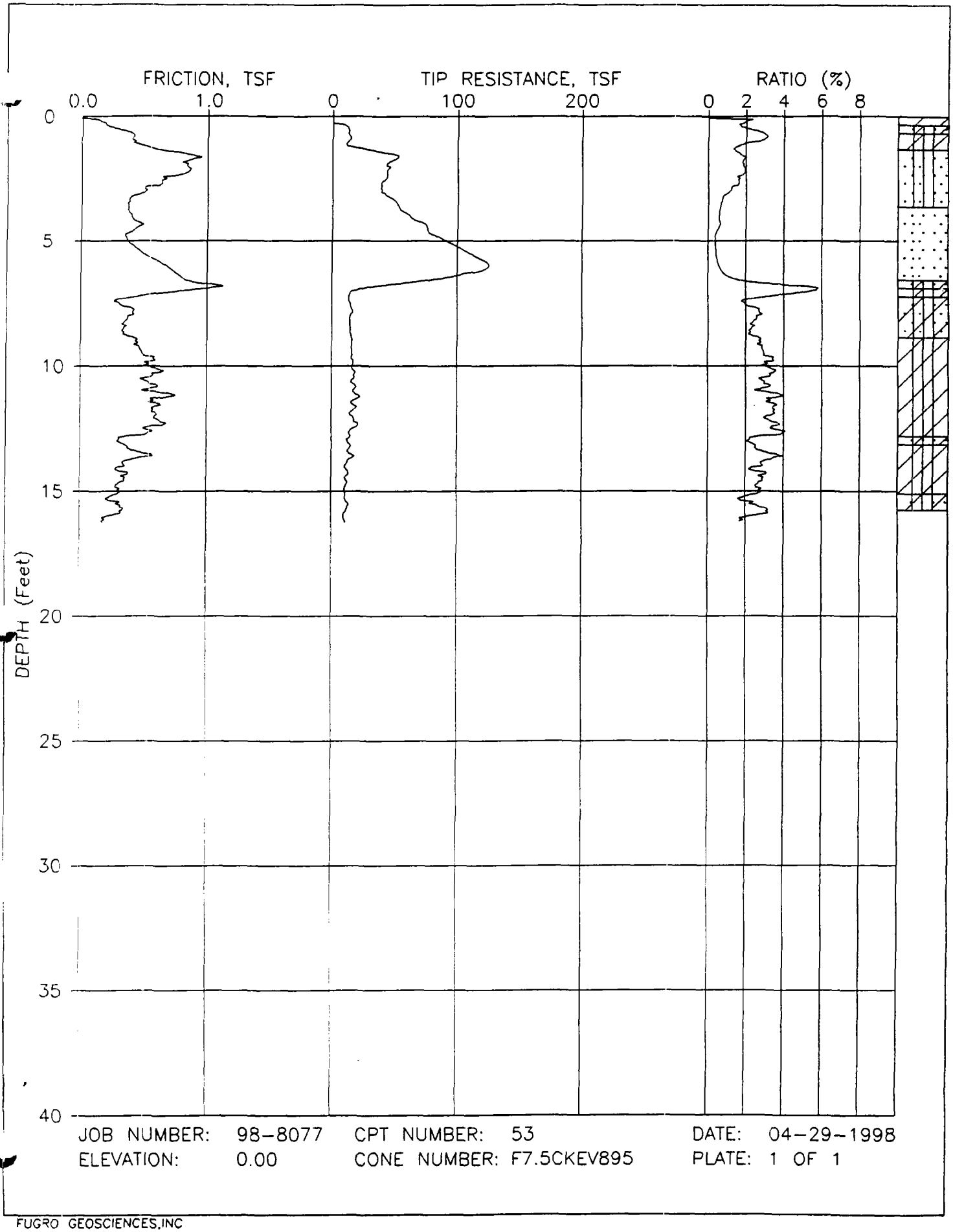
JOB NUMBER: 98-8077 CPT NUMBER: 51 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



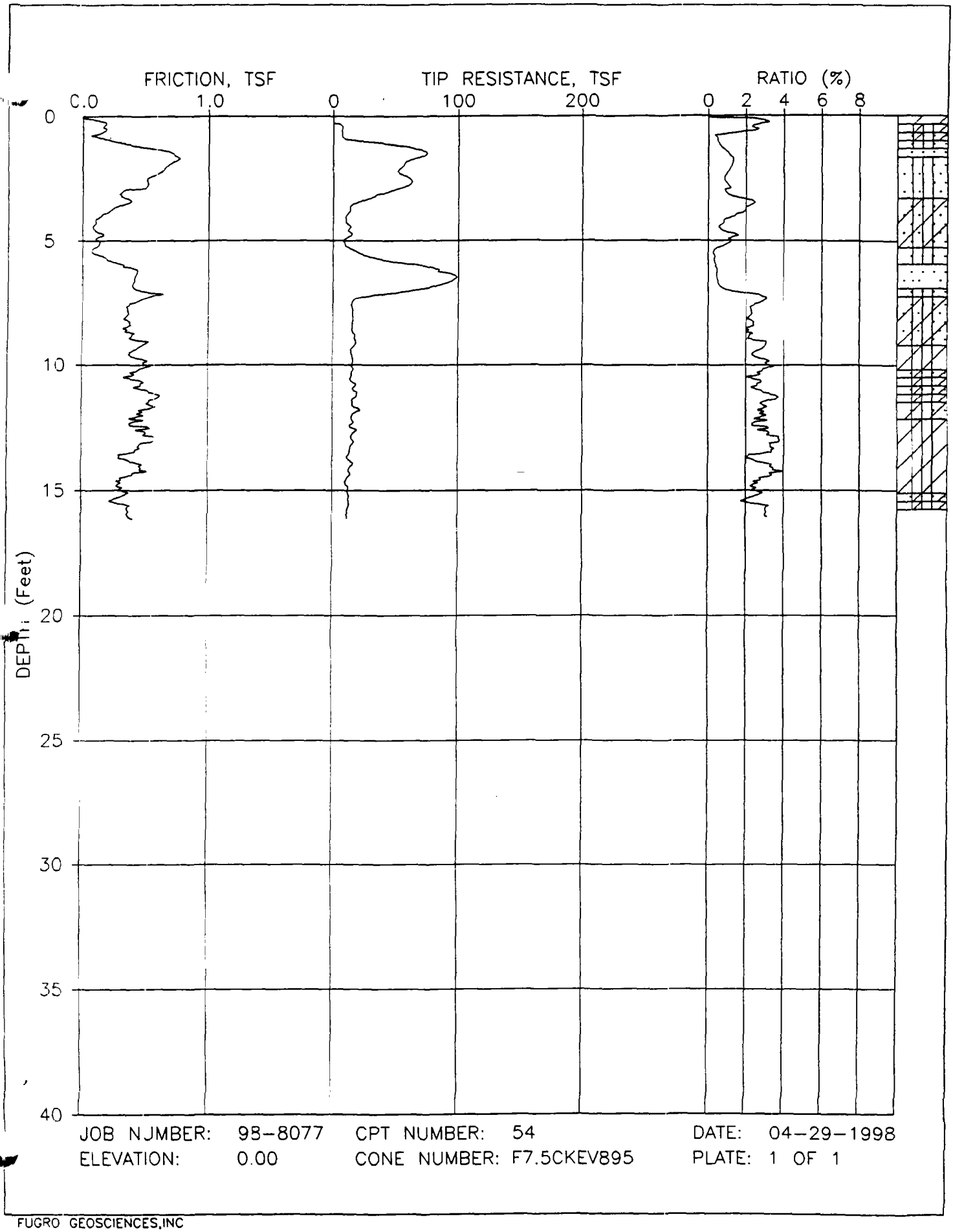
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 53 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

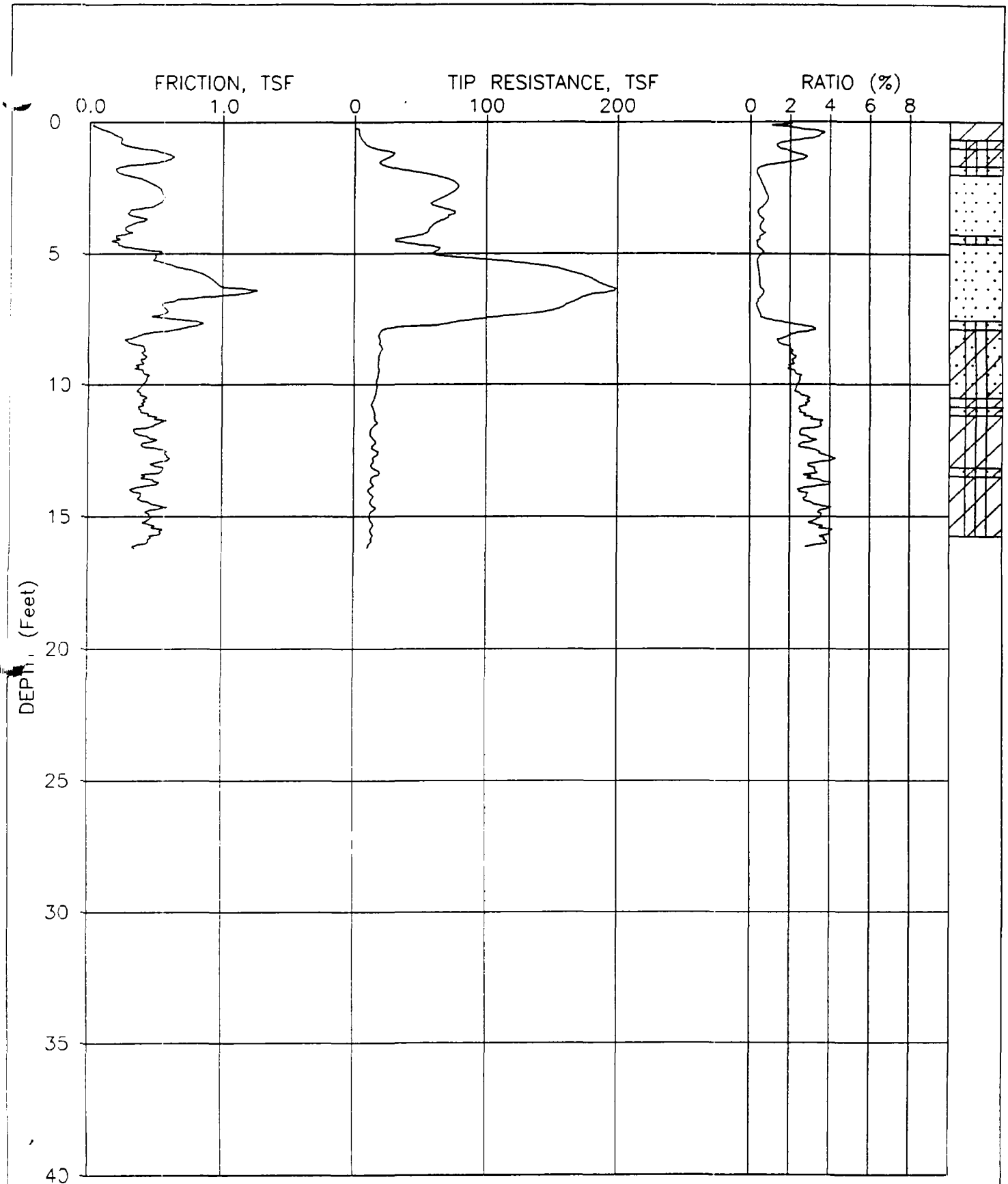
FUGRO GEOSCIENCES,INC



JOB NJMBER: 98-8077 CPT NUMBER: 54 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

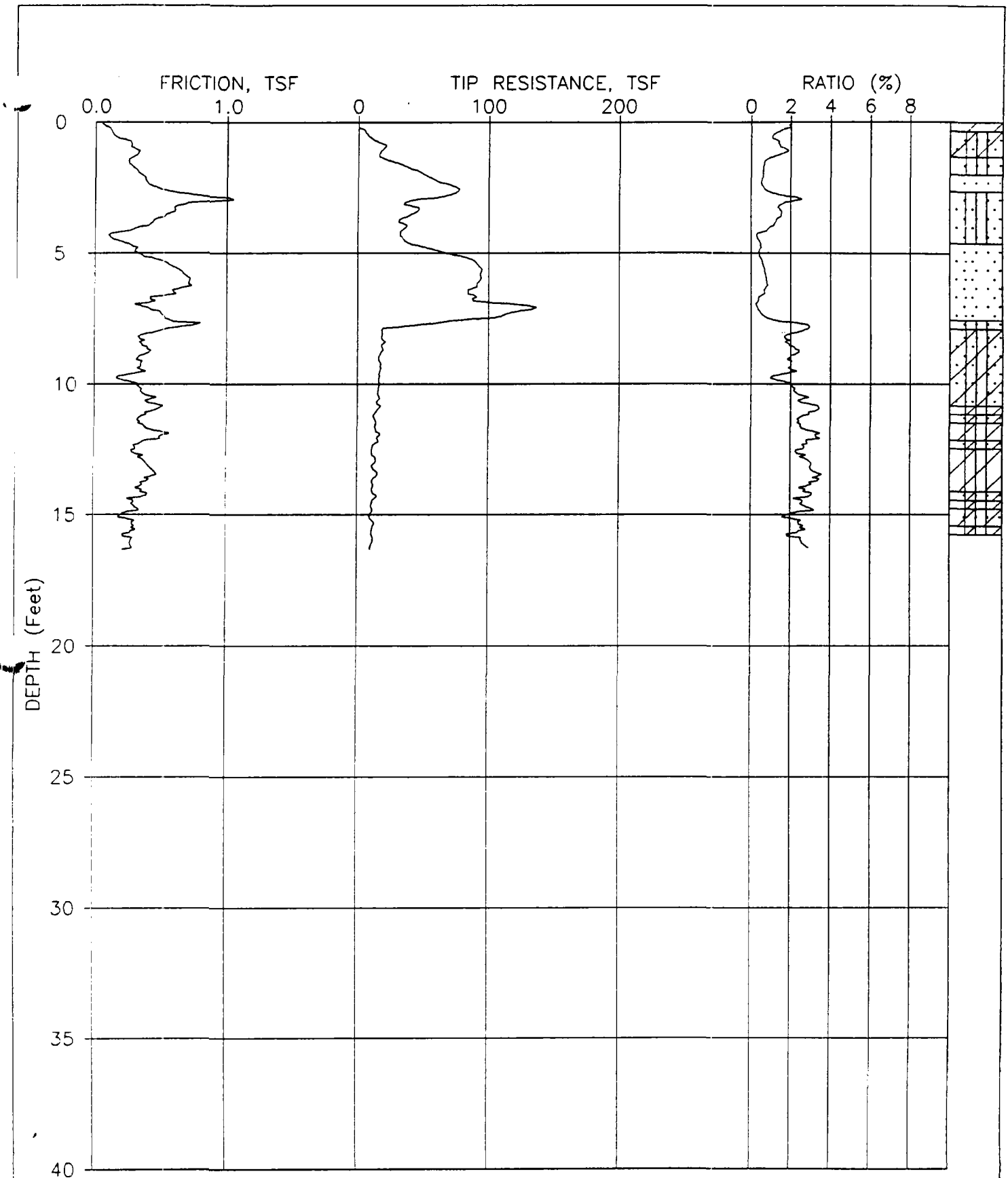
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 55 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

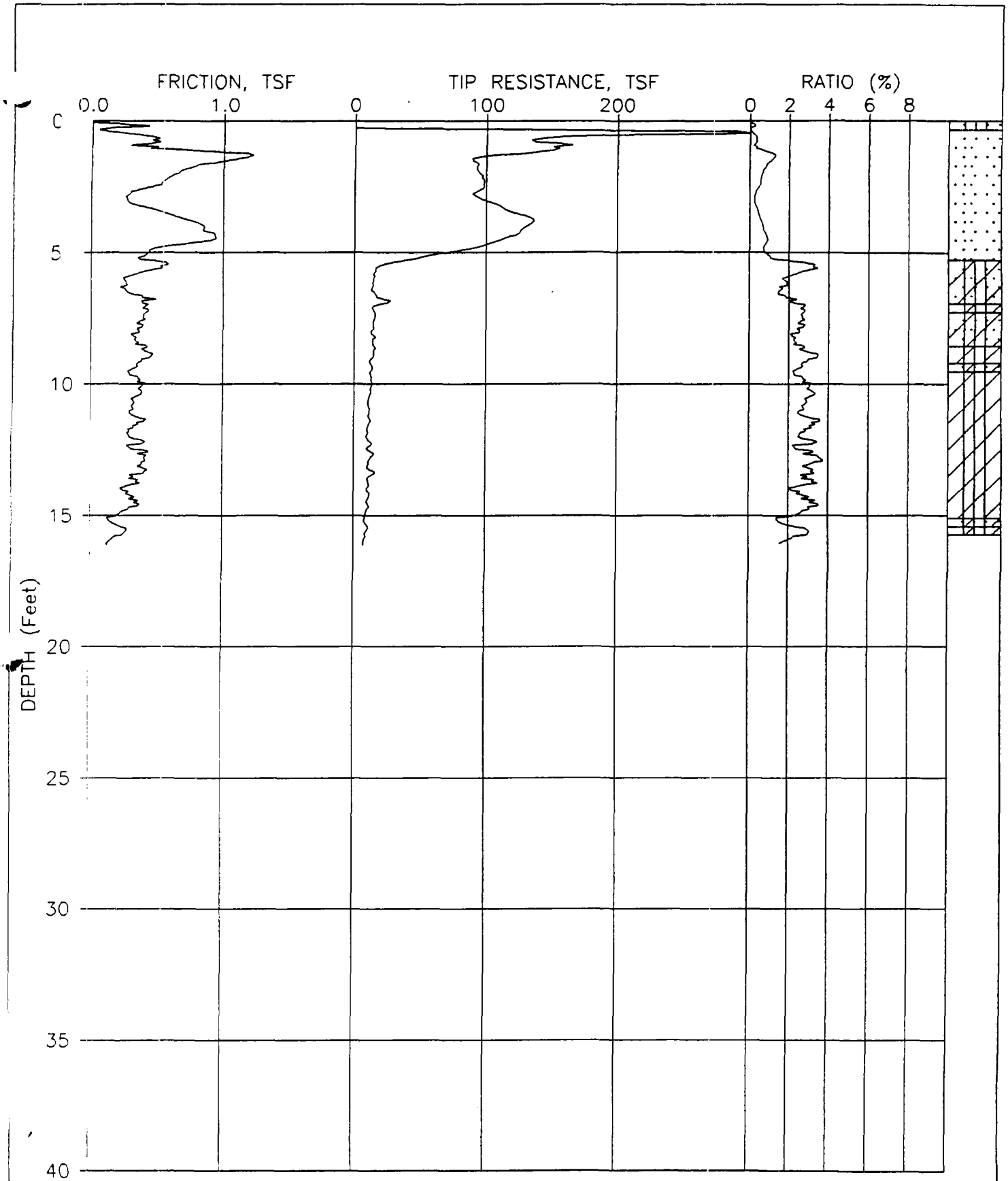
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 56 DATE: 04-29-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

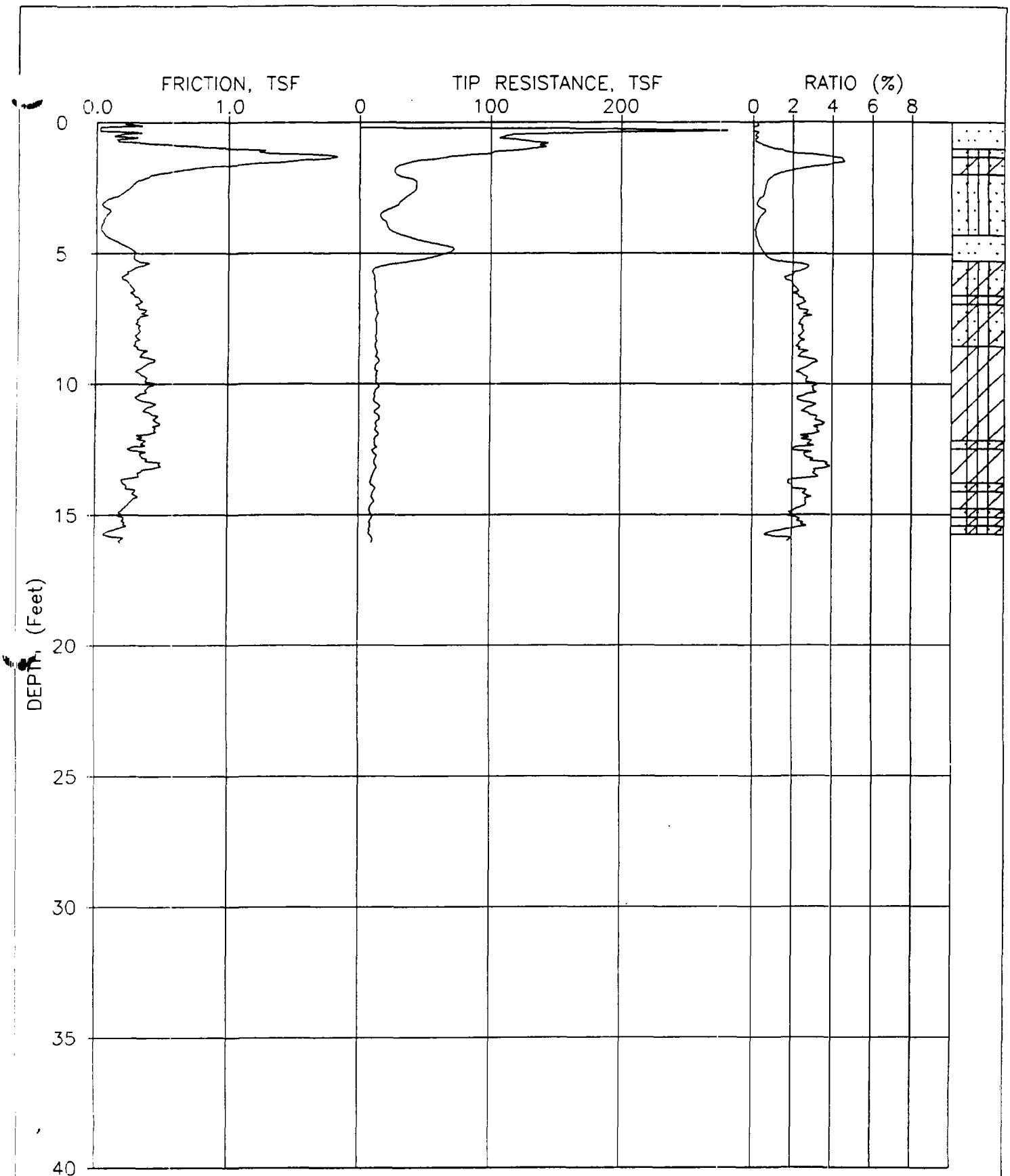
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 57 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

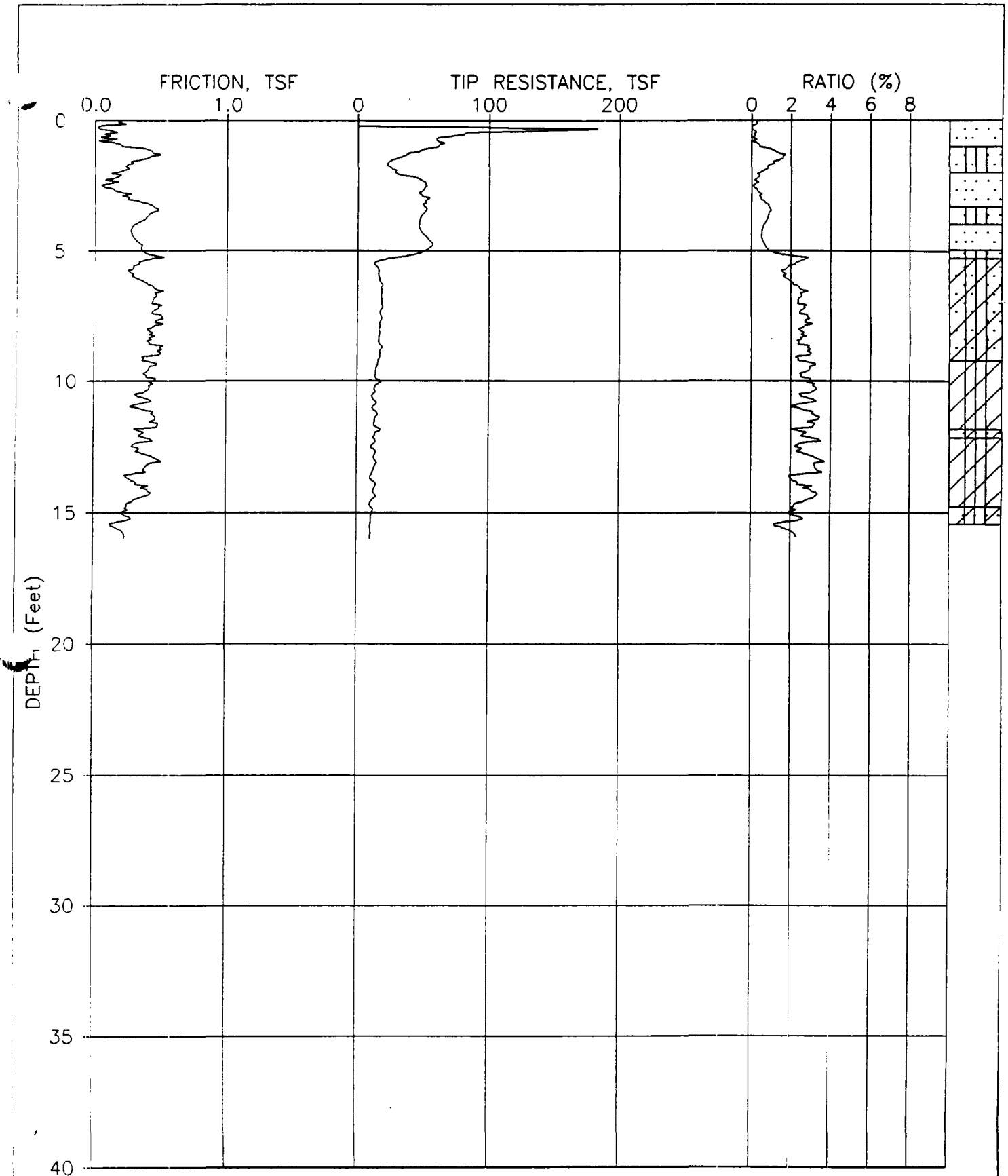
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 58 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

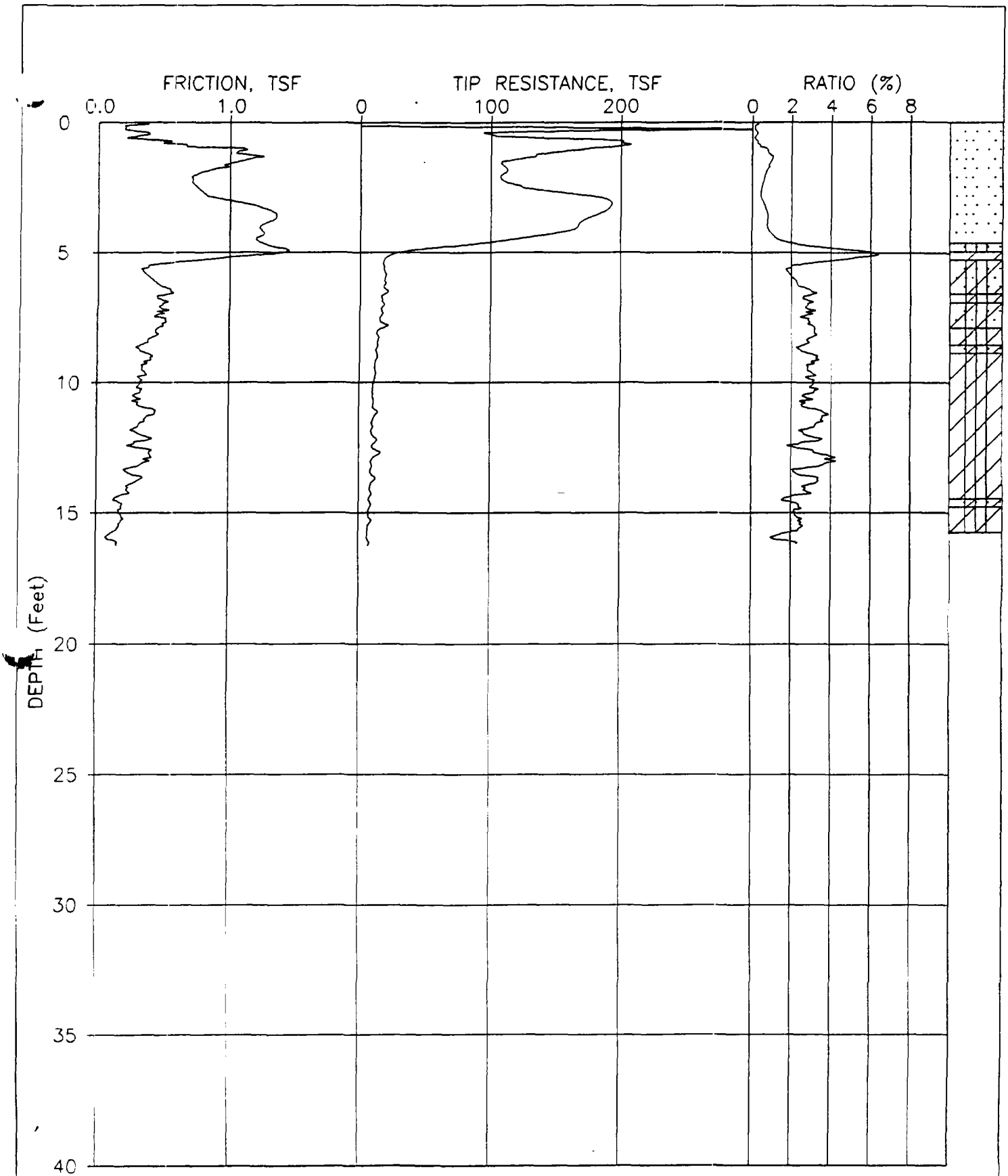
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 59 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

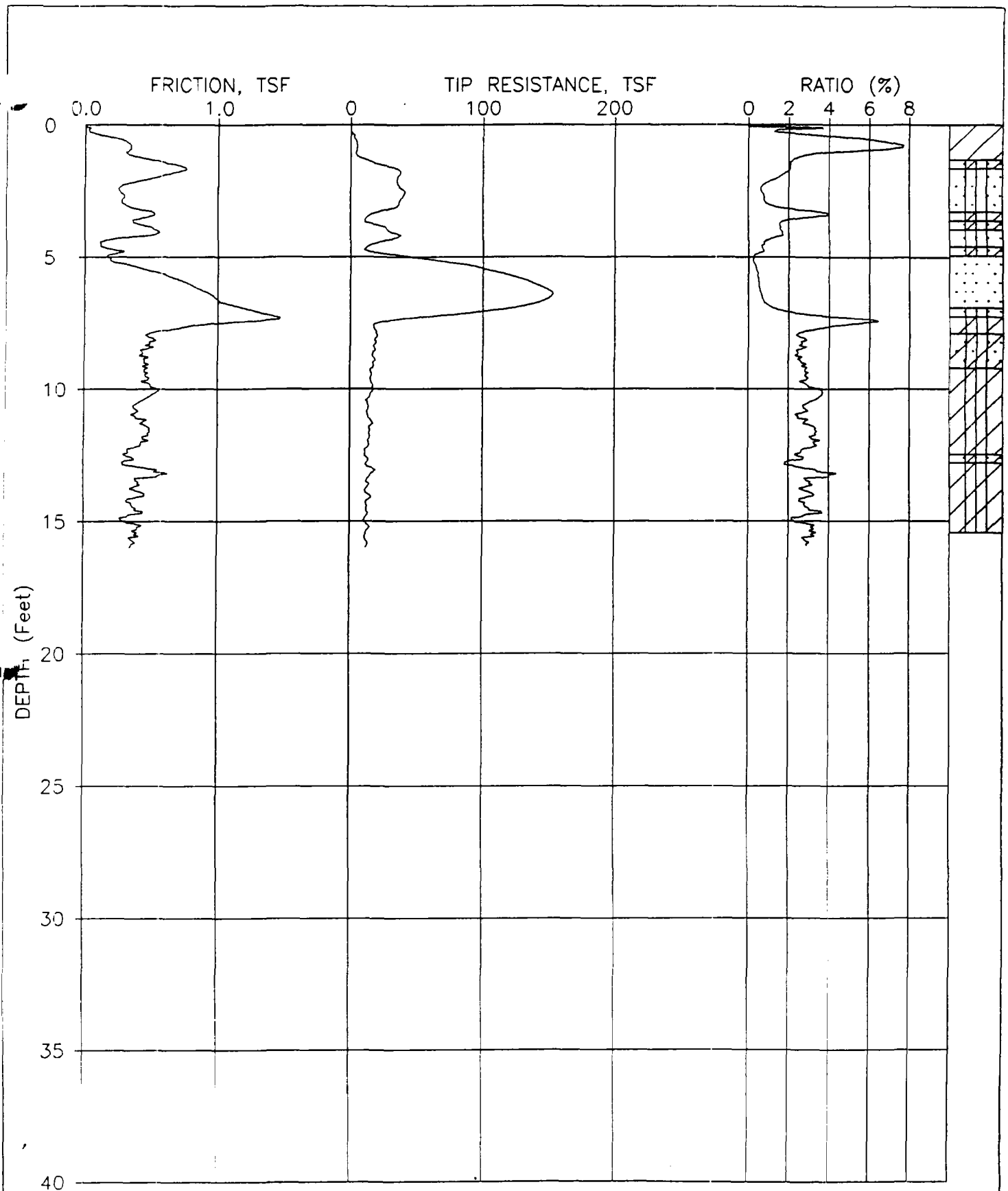
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 60 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

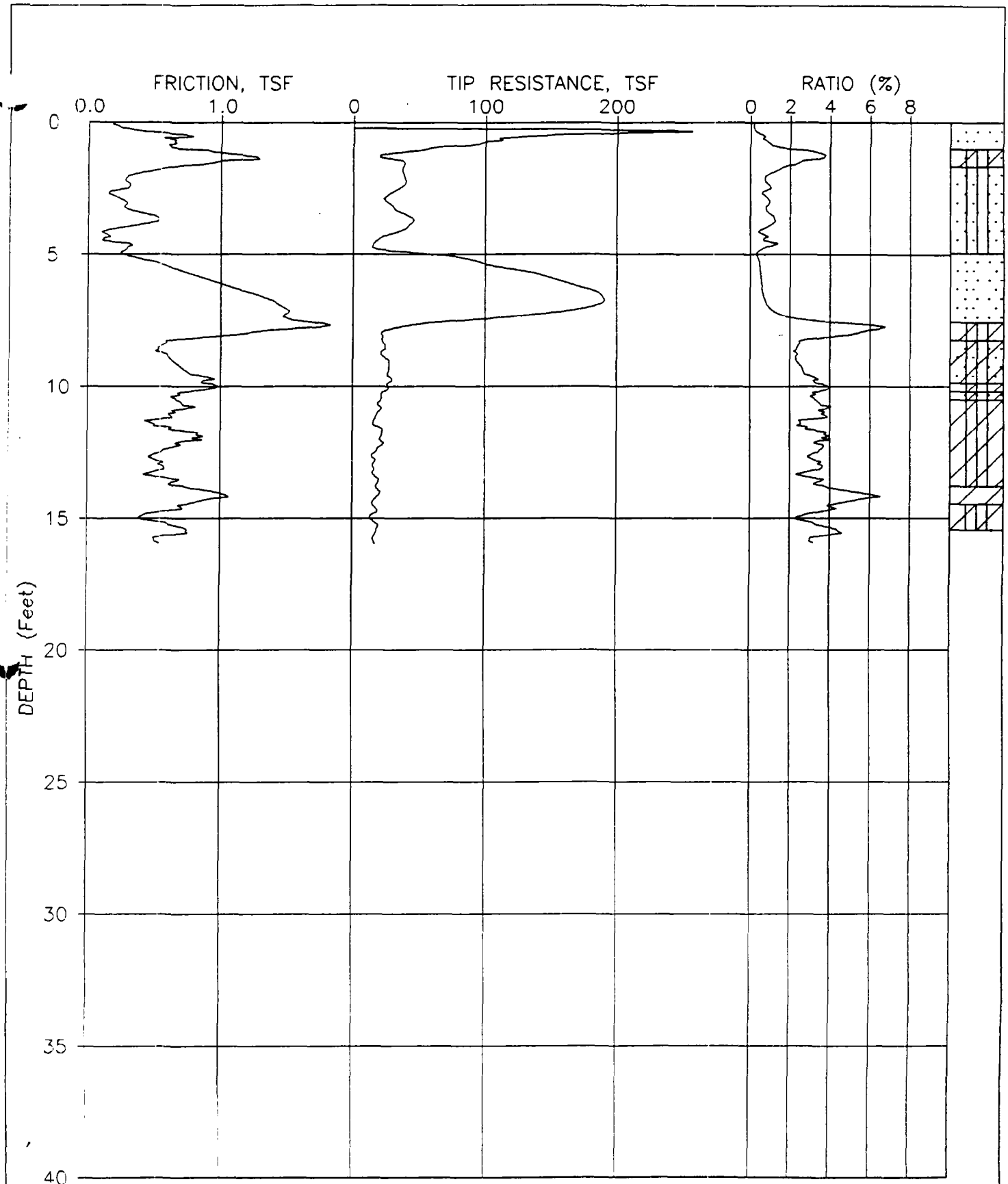
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 61 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

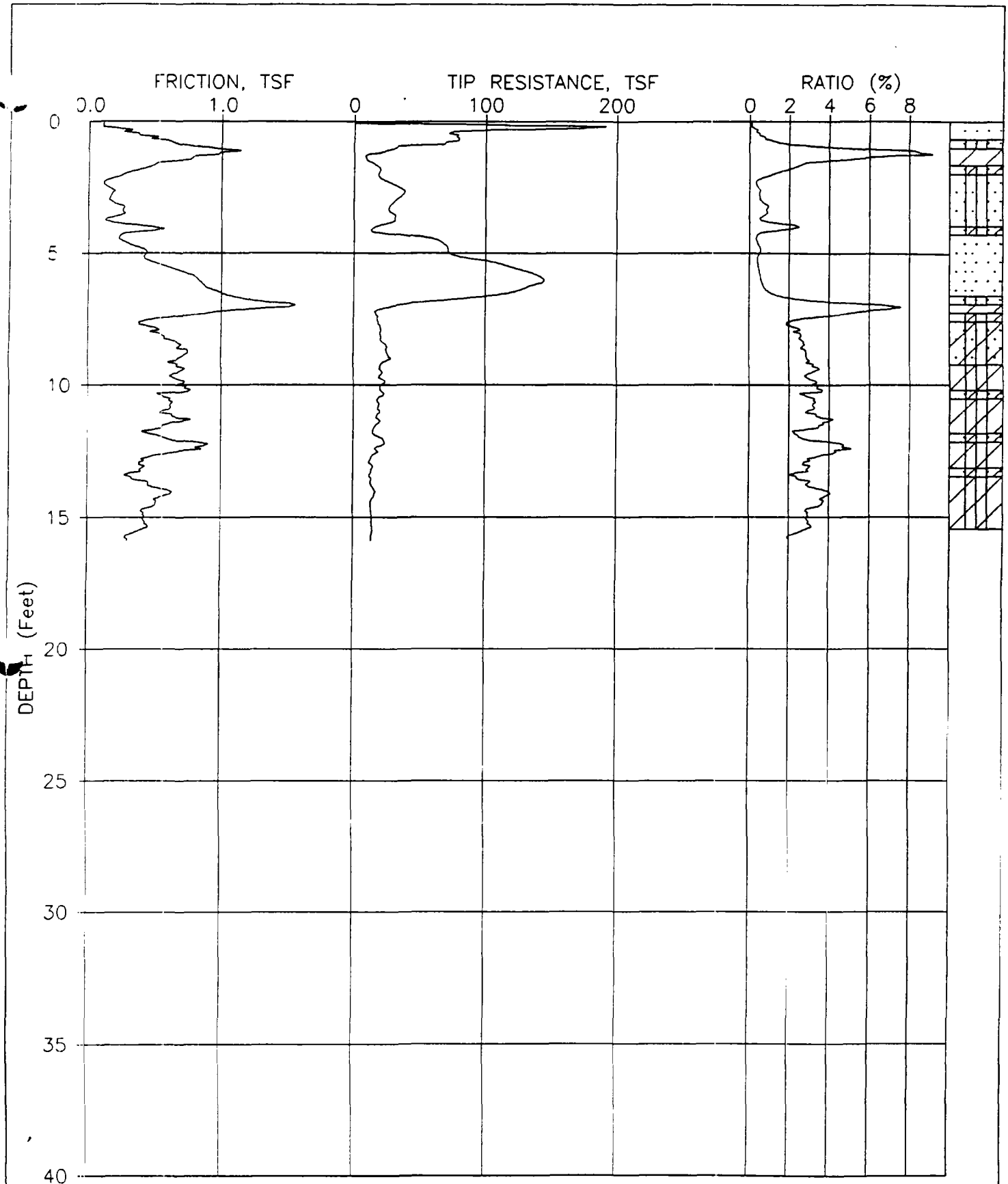
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 62 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

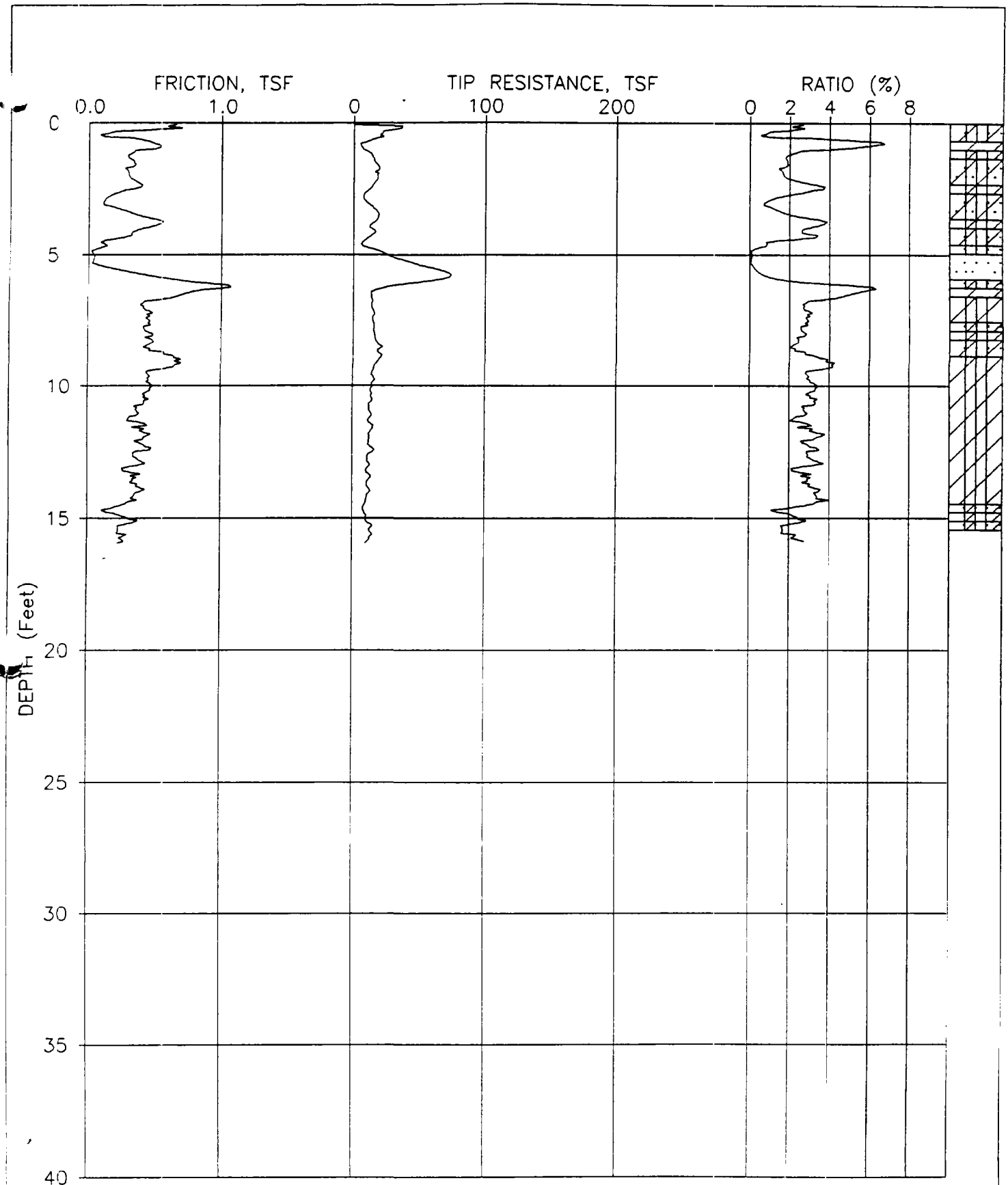
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 63 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

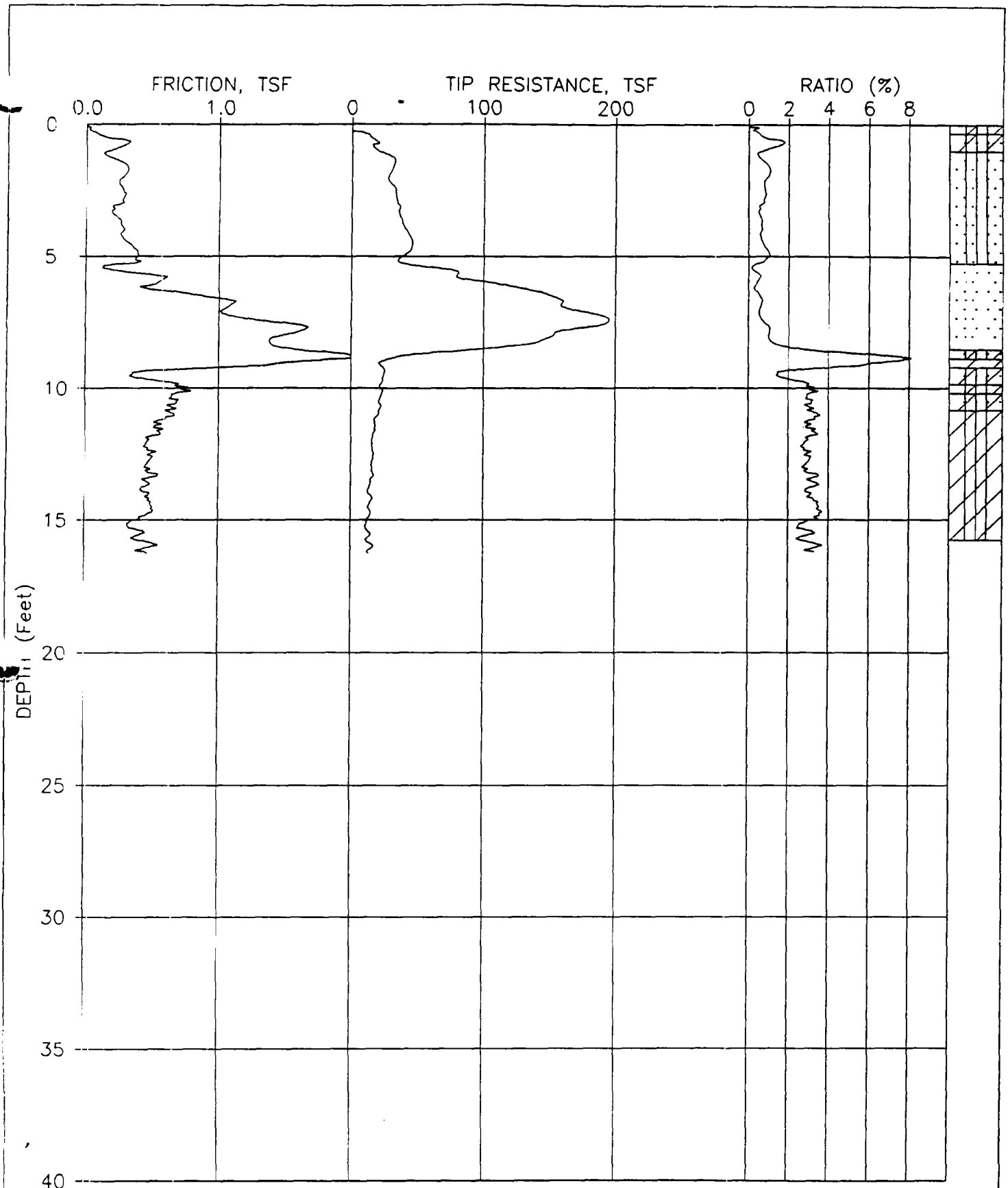
FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: 64 DATE: 04-30-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 98-8077 CPT NUMBER: BG-1 DATE: 04-28-1998

ELEVATION: 0.00 CONE NUMBER: F7.5CKEV895 PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC

APPENDIX C

Geoprobe And Test Pit Logs

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-1

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1663448.09 / 719234.69	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/8/98	5/6/98	Terra Probe	Geoprobe	2"	12

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
10.4 / 87	0	3	NA	624.98	▽ 7 / *618.0* ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring BG-1

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/3.4	NA	NA	*624.5* .5	**TOPSOIL.**	
					brown fine **SAND**: damp; loose, damp; rust staining (oxidation) @ moisture interface @ 3.0 ft.	
MC-2/ SS-2	4.0/4.0	NA	NA			
				619.5 5.5		
				619.2 5.8	gray brown **SILT**: seam.	
					brown fine **SAND**: loose; shell fragments; saturated.	
					▽ ...same as above.	Soil samples PWM001- SB1-SS3-0385 collected from the 9.0-11.0 feet interval.
MC-3/ SS-3	4.0/3.0	NA	NA			
				614.0 11.0	dark gray **CLAY**: with silt, laminated; damp; plastic.	
				613.0 12.0	end of boring, 12.0 ft.	

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-2

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1661773.99 / 718727.39	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/8/98	5/8/98	Terra Probe	Geoprobe	2"	5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
3.4 / 68	0	2	NA	621.17	▽ NE / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-27

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	3.0/1.9	NA	NA		**TOPSOIL**: dark brown silty clay; damp; trace sand & gravel.	
					black organic rich seam.	
				618.9 2.2	...same as above; with increased sand content.	
					clayey **SAND**	
				617.7 3.5	dark gray **CLAY**: with fine silt seams; damp; small fine sand lenses. (lacustrine)	
MC-2/ SS-2	2.0/1.5	NA	NA			Soil samples PWM001-SB2-SS2-0385 collected from the 2.0-3.5 feet interval.
				616.2 5.0	end of boring, 5.0 ft.	

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-3

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662346.79 / 719080.75	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	7

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
5.8 / 83	0	2	NA	621.11	▽ 3.5 / *617.6* ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-39

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	3.0/1.8	NA	NA		dark brown silty **SAND**: with little clay; damp; slightly cohesive.	
					...same as above; becomes mottled light brown/orange.	
				619.1 2.0	**CLAY.**	
				617.6 3.5	dark gray **SILT**: loose; saturated.	
MC-2/ SS-2	4.0/4.0	NA	NA	*617.1* 4.0	dark gray **CLAY**: with silt seams; damp; plastic; cohesive. (lacustrine)	Took an additional tube to 4 ft. to obtain enough sample.
				616.1 5.0	**SILT.**	
				615.6 5.5	...same as clays above; lacustrine.	
					end of boring, 8.0 ft.	
				614.1 7.0		Soil samples PWM001- SB3-SS2-D385 collected from the 3.5-5.5 feet interval.

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-4

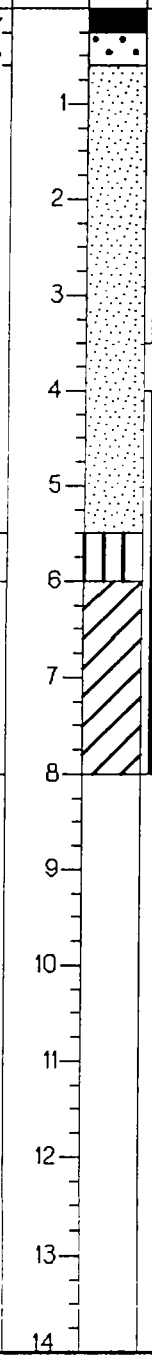
SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662167.54 / 718774.95	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	8

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
7.5 / 94	0	2	NA	621.90	▽ NR / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-57

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/3.5	NA	NA	621.7 .2 / 621.3 .8	**ASPHALT**: with under laymen: loose gravel.	
					brown fine **SAND**: with some silt; loose; damp.	
					...same as above; becomes b ack in color; moist; slight chemical odor.	
MC-2/ SS-2	4.0/4.0	NA	NA		...same as above; becomes coarser sand; strong sheen.	Soil samples PWM001-SB4-SS2-0385 collected from the 4.0-8.0 feet interval.
				616.4 5.5	gray **SILT** saturated; loose to slightly cohesive.	
				615.9 6.0	dark gray **CLAY**: with fine; damp; plastic; cohesive; (lacustrine).	
				613.9 8.0	end of boring, 8.0 ft.	



GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-5

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662057.92 / 718831.31	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	9

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
8.0 / 89	0	3	NA	620.92	▽ NR / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponde to CPT Boring CPT-4

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/3.5	NA	NA		mottled brown/black sandy **CLAY**: damp; cohesive; roots.	
				618.9 2.0	dark gray/black silty **SAND**: with sparse gravel; damp; loose to slightly cohesive.	
MC-2/ SS-2	1.0/1.0	NA	NA			
MC-2a/ SS-2	4.0/3.5	NA	NA		...same as above, strong odor and sheen.	Soil samples PWM001-SB5-SS2- D385 collected from the 5.0-7.0 feet interval.
				613.9 7.0	dark gray **CLAY**: with silt seams; damp; plastic; sheen and product in silt seams in upper portion of unit.	
				611.9 9.0	end of boring, 9.0 ft.	

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-6

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1862054.27 / 718605.06	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	8.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
NR / NR	0	2	NA	623.69	▽ 6 / *617.7* ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-61

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/NR	NA	NA	*622.7* 1.0	**TOPSOIL**: moist-wet.	
					brown fine **SAND**: with trace silt; loose; damp.	
MC-2/ SS-2	4.0/NR	NA	NA	*619.2* 4.5	...same as above; wet.	
				618.7 5.0	brown silty **CLAY**: with sand; damp; plastic; soft to firm; cohesive.	
					brown fine **SAND**: wet.	
					▽ ...same as above; gray in color; strong odor and sheen.	
				616.2 7.5	dark gray **CLAY**: with silt; (lacustrine).	Soil samples PWM001-SB8-SS2- D385 collected from the 8.0-7.5 feet interval.
				615.7 8.0	end of boring, 8.0 ft.	Acetate tube stuck in macro sampler, offset & redrilled. Field blank taken @ this location.

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GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-7

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662069.74 / 718730.01	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	10

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
9.8 / 98	0	3	NA	623.98	▽ 5 / *619.0* ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-56

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/4.0	NA	NA	*623.5* .5	1			dark organic rich **TOPSOIL**: sand & silt; loose-slightly cohesive; damp.	
				622.5 1.5	2			light brown fine **SAND**: with silt.	
MC-2/ SS-2	4.0/3.8	NA	NA	*620.3* 3.7	4			dark brown silty fine **SAND**: little clay; moist; slightly cohesive.	
				619.0 5.0	5		▽	gray fine **SAND**: loose wet.	
					6				
					7			Strong odor and sheen	Soil samples PWM001- SB7-SS2-0385 collected from the 7.0-8.5 feet interval.
MC-3/ SS-3	2.0/3.5	NA	NA		8			sand coarsens with shell fragments; strong odor and sheen.	
					9				
				614.5 9.5				dark gray **CLAY**: with silt; (lacustrine).	
				614.0 10.0	10			end of boring, 10.0 ft.	
					11				
					12				
					13				
					14				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-8

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1661925.58 / 718785.09	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	8

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
6.3 / 79	0	2	NA	622.38	▽ 4 / *618.4* ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-48

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/2.3	NA	NA		dark black sandy **SILT**: damp; loose to slightly cohesive; slightly plastic.	
				621.4 1.0	mottled brown/black/rust silty **CLAY**: with sand; damp; cohesive; slightly plastic; **FILL**	
MC-2/ SS-2	4.0/4.0	NA	NA	*618.4* 4.0	dark gray/gray black fine to medium **SAND**: loose; wet; strong odor and sheen.	Soil samples PWM001- SB8-SS2-D385 collected from the 4.0-8.5 feet interval.
				615.9 6.5	dark gray **CLAY**: with silt; damp; plastic laminates; very thin fine gray sand seams; lacustrine.	
				614.4 8.0	end of boring, 8.0 ft.	

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-9

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662233.71 / 718769.20	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	8

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
7.6 / 95	0	2	NA	620.91	▽ NR / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-16

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/3.8	NA	NA		dark brown silty **CLAY**: with sand	
				618.9 2.0	light brown fine **SAND**: little silt; damp to moist; slightly cohesive	
MC-2/ SS-2	4.0/4.0	NA	NA			
				615.9 5.0	gray **CLAY**: laminated w/ silt & fine sand seams – seams possess odor and staining; damp; firm to soft (lacustrine.	
				612.9 8.0	end of boring, 8.0 ft.	Soil samples PWM001-SB9-SS2- 0385 collected from the 4.5-6.0 feet interval.

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	SB-10

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662081.78 / 718864.89	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/6/98	5/6/98	Terra Probe	Geoprobe	2"	8

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
7 / 87	0	2	NA	621.97	▽ NR / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
4 ft. Macro-core w/acetate liners	NA	Corresponds to CPT Boring CPT-58

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
MC-1/ SS-1	4.0/3.0	NA	NA		1			dark brown (organic rich) **SILT**: with root material; loose to slightly cohesive	
				620.0 2.0	2			dark gray fine **SAND**: with little silt; damp; loose to slightly cohesive.	
					3			...same as above.	
MC-2/ SS-2	4.0/4.0	NA	NA		4			Strong Odor & Sheen (Free Product)	Soil samples PWM001-SB10-SS2- D385 collected from the 4.0-8.0 feet interval.
					5				
				616.0 6.0	6			Dark gray **CLAY**: with silt and sand seams (thin);	
					7				
				614.0 8.0	8			end of boring, 8.0 ft.	
					9				
					10				
					11				
					12				
					13				
					14				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	TP-1

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662345.57 / 718986.30	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/7/98	5/7/98	Heritage	Backhoe	PIT	7.6

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
NA / NA	0	0	NA	621.23	▼ NA / ▼ NA	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
2 ft. WIDE BUCKET	NA	Corresponds to CPT Boring CPT-40

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					1			Mottled brown and orange silty **CLAY**: with sand; becomes less mottled with depth	
					2				No detectable odors or staining observed
					3				
					4				Very little water entering excavation
					5				
				615.1 6.1	6			dark gray **CLAY** (Lacustrine)	
					7				
				613.6 7.6				BASE OF PIT	Excavated material returned to Pit per EPA approval
					8				
					9				
					10				
					11				
					12				
					13				
					14				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	TP-2

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662237.25 / 719097.28	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/7/98	5/7/98	Heritage	Backhoe	PIT	9.6

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
NA / NA	0	0	NA	621.00	▽ NA / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
2 ft. WIDE BUCKET	NA	Corresponds to CPT Boring CPT-38

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					1			dark brown silty **CLAY**: with sand	
				619.0 2.0	2			mottled brown/orange/gray silty **CLAY**: damp; plastic (very weathered lacustrine deposit)	
					3				
					4				
				616.0 5.0	5			becomes brown (water flowing into hole out of interface)	
					6				
					7				
				613.0 612.8 8.1	8			small sand seam	Significant amount of water entering pit
					9				
				611.4 9.6	10			BASE OF PIT	Excavated material returned to Pit per EPA approval
					11				
					12				
					13				
					14				

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GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	TP-3

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662074.56 / 719014.87	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/7/98	5/7/98	Heritage	Backhoe	PIT	6.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
NA / NA	0	0	NA	621.51	▽ NA / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
2 ft. WIDE BUCKET	NA	Corresponds to CPT Boring CPT-35

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
				620.0 1.5	1			dark brown clayey **SILT**: Dry	
					2			mottled lt. brown/orange silty **SAND**:	
				618.5 3.0	3			brown fine **SAND**: with silt; wet	
				618.0 3.5	4			mottled brown/gray silty **CLAY**: plastic; damp to moist	
					5				
				615.5 6.0	6			BASE OF PIT	No detectable odor or staining Excavated materials returned to Pit per EPA approval
					7				
					8				
					9				
					10				
					11				
					12				
					13				
					14				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	TP-4

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662047.84 / 718940.13	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/7/98	5/7/98	Heritage	Backhoe	PIT	5.3

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
NA / NA	0	0	NA	620.97	▽ NA / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
2 ft. WIDE BUCKET	NA	Corresponds to CPT Boring CPT-33

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
				620.0 1.0	1			dark brown sandy **SILT**: with clay; slightly cohesive; damp	
					2			mottled silty **SAND**:	
				618.5 2.5				dark gray (stained) **SAND**: wet	
				618.0 3.0	3			silty **SAND**:	PID/FID air readings range from 8.3 to 9.4 ppm
				617.0 4.0	4			brown and gray silty **CLAY**: damp; plastic	
				615.7 5.3	5			BASE OF PIT	Excavated materials returned to Pit per EPA approval
					6				
					7				
					8				
					9				
					10				
					11				
					12				
					13				
					14				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	TP-5

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1661925.58 / 718785.09	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/7/98	5/7/98	Heritage	Backhoe	PIT	7.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
NA / NA	0	0	NA	622.38	▽ NA / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
2 ft. WIDE BUCKET	NA	Corresponds to CPT Boring CPT-48

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
				621.4 1.0	1			light brown fine **SAND**	
					2			dark brown to gray mottled silty **SAND**: with clay; cohesive	
					3				
				618.4 4.0	4			approximately 3 inch seam (creosote rich)	Staining @ 3.9 to 4.0 feet Free Product oozing into Pit Jar of soils and product taken
					5				
					6				
				615.9 6.5	7			gray **CLAY**: (Lacustrine)	
				614.9 7.5	8			BASE OF PIT	Excavated materials returned to Pit per EPA approval
					9				
					10				
					11				
					12				
					13				
					14				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
Toledo Tie	PWM001	1 of 1	TP-6

SITE	COORDINATES	LOGGED BY	CHECKED BY
Toledo, OH	1662069.74 / 718730.01	Jeff Arp	

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
5/7/98	5/7/98	Heritage	Backhoe	PIT	7.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
NA / NA	0	0	NA	622.38	▽ NA / ▼ NA /	NA /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
2 ft. WIDE BUCKET	NA	Corresponds to CPT Boring CPT-58

SAMPLE NUMBER	LENGTH/RECOV. (feet)	BLOW COUNTS (6"-12"-6")	PID (ppm)	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
				621.4 1.0	1			dark organic rich silty **SAND**: gades to lighter with depth	
								Light brown fine **SAND**	
					2				
					3				
				618.4 4.0	4			gray fine **SAND**: wet	
					5				
					6				Test Pit terminated due to excessive amount of water and contaminants in Pit
				615.9 6.5					
					7			Strong staining, sheen & Free Product	
				614.9 7.5				BASE OF PIT	Excavated materials returned to Pit per EPA approval
					8				Jar of soils and product taken
					9				
					10				
					11				
					12				
					13				
					14				

APPENDIX D

Geologic Cross Sections

SDMS US EPA Region V

Imagery Insert Form

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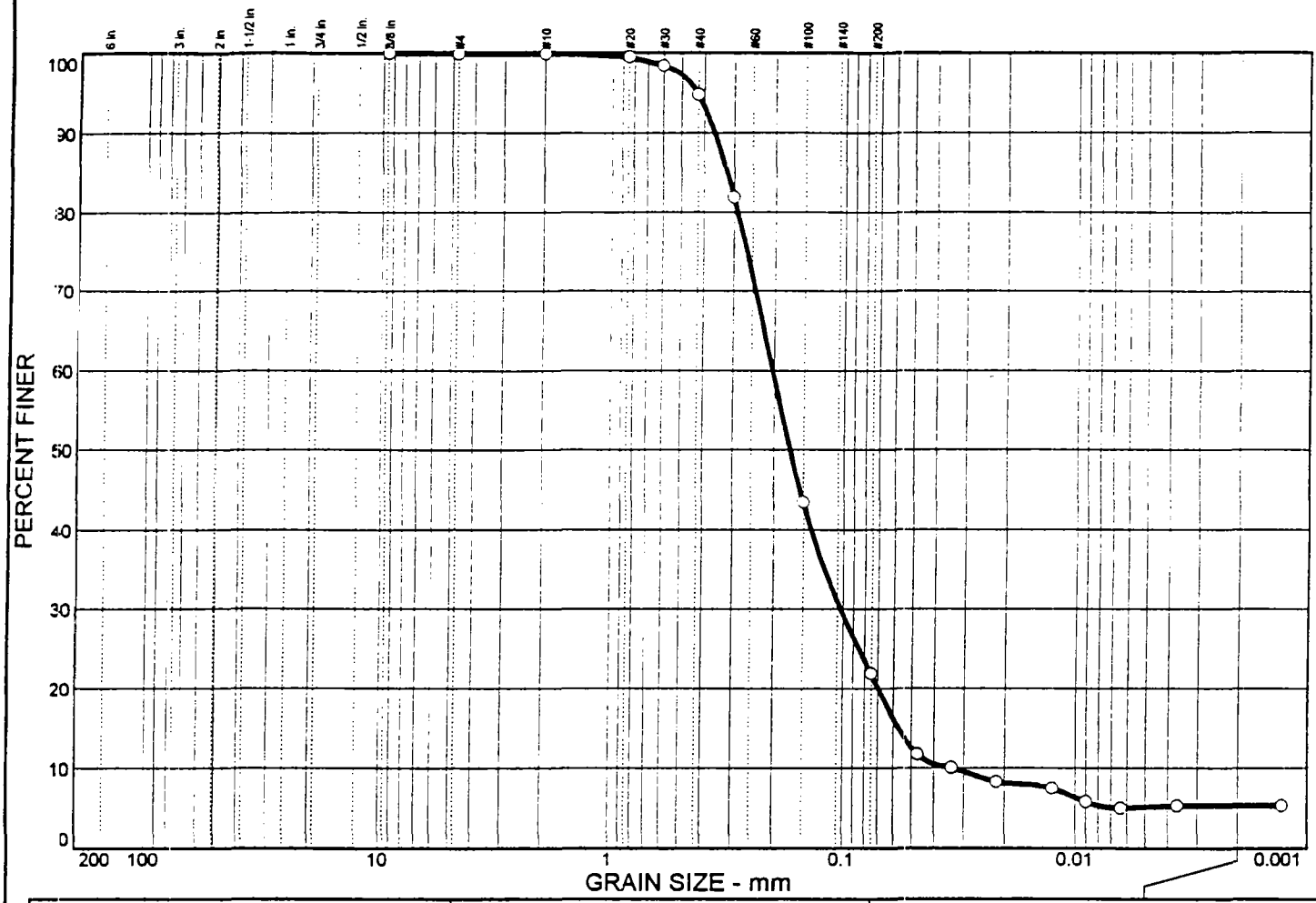
APPENDIX D – GEOLOGIC CROSS SECTIONS

☐ **Other:**

APPENDIX E

Geotechnical Data

USCS Particle Size Distribution Report



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.1	0.0	5.1	72.9	16.6	5.3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	0.320	0.204	0.171	0.103	0.0569	0.0338	1.53	6.03

MATERIAL DESCRIPTION	USCS	AASHTO
○ BROWN SILTY SAND	SM	

Project No. PWM-001 **Client:** KERR-McGEE CHEMICAL, LLC

Project: TOLEDO TIE TREATMENT SITE

○ **Location:** 98-567 CPT BG-1 SB-1 DEPTH: 5.0-8.0'

Remarks:

○ TESTED BY: RM/MJG

CHECKED BY: JPL

NATURAL MOISTURE: 23.2%

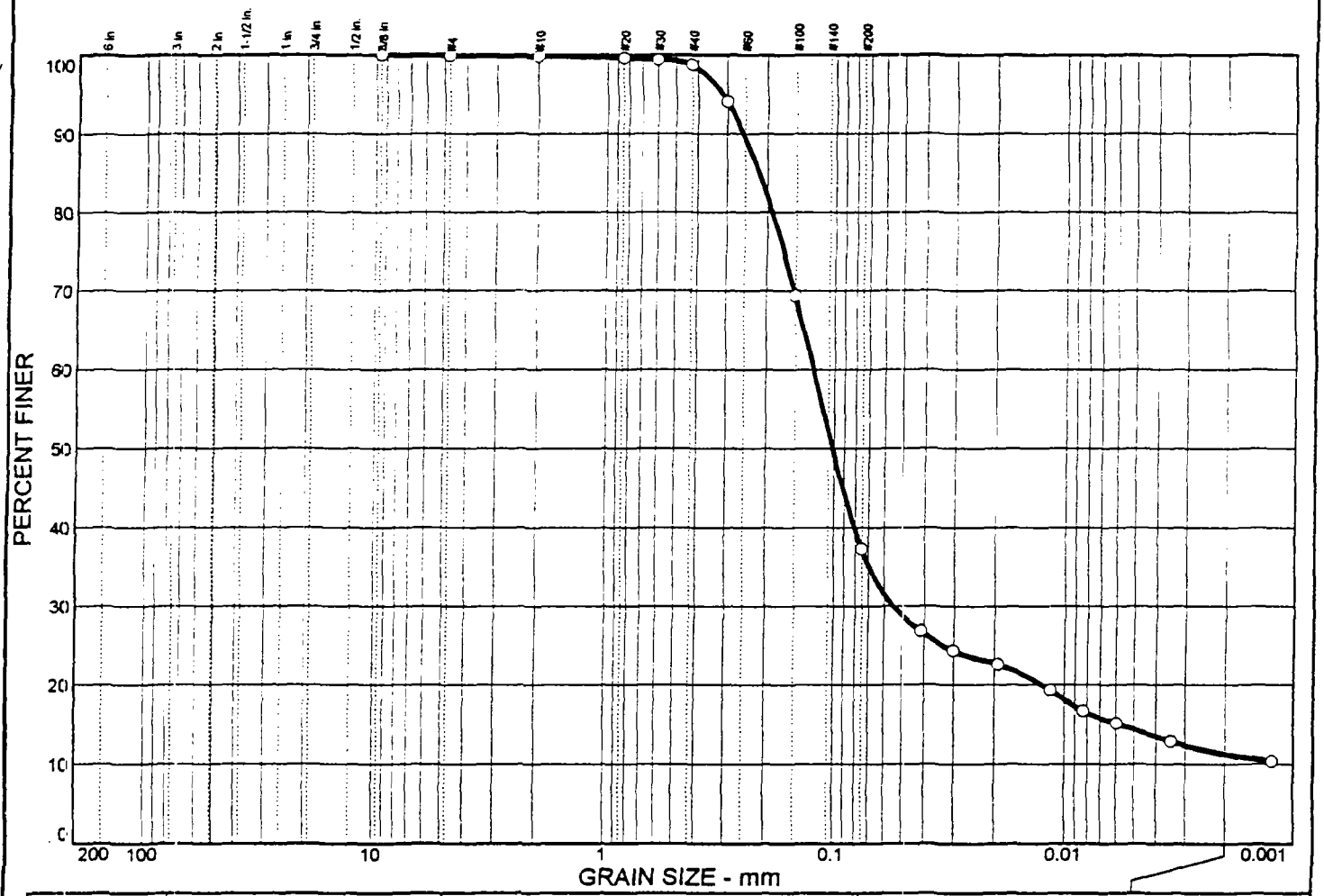
SPECIFIC GRAVITY: 2.63

USCS Particle Size Distribution Report

HULL & ASSOCIATES, INC.

FIGURE NUMBER

USCS Particle Size Distribution Report



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.1	0.1	1.1	61.4	26.1	11.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	0.218	0.124	0.102	0.0547	0.0058			

MATERIAL DESCRIPTION	USCS	AASHTO
○ BROWN/GREY SILTY SAND	SM	

Project No. PWM-001 **Client:** KERR-McGEE CHEMICAL, LLC

Project: TOLEDO TIE TREATMENT SITE

○ **Location:** 98-568 SB-3 CPT-39(SAND) DEPTH: 4.0-8.0'

Remarks:

○ TESTED BY: RM/MJG

CHECKED BY: JPL

NATURAL MOISTURE: 16.0%

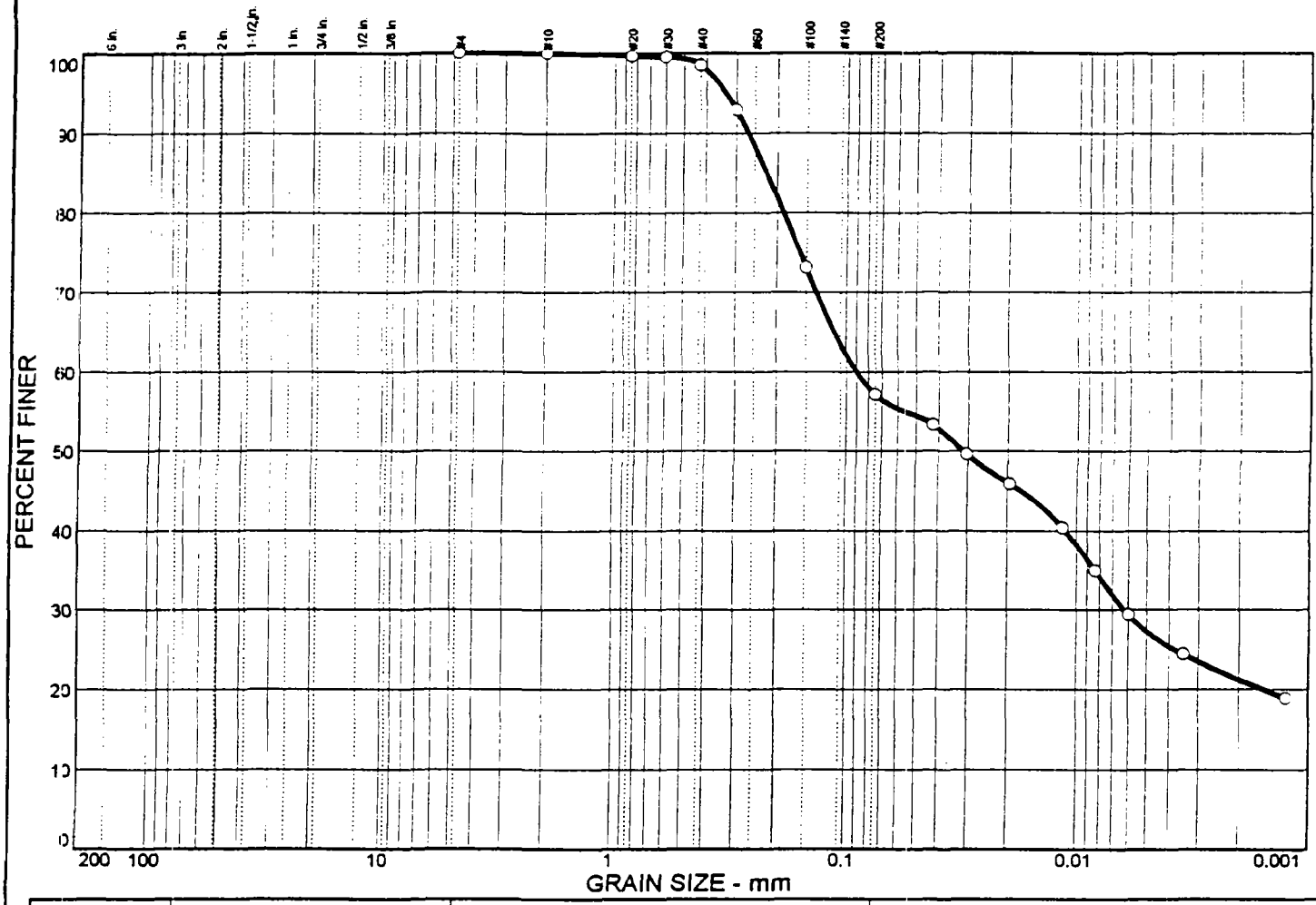
SPECIFIC GRAVITY: 2.63

USCS Particle Size Distribution Report

HULL & ASSOCIATES, INC.

FIGURE NUMBER

USCS Particle Size Distribution Report



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	1.5	41.4	29.9	27.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	26	15	0.222	0.0902	0.0315	0.0062				

MATERIAL DESCRIPTION	USCS	AASHTO
○ GREY/BROWN SANDY LEAN CLAY	CL	

Project No. PWM-001 **Client:** KERR-McGEE CHEMICAL, LLC

Project: TOLEDO TIE TREATMENT SITE

○ **Location:** 98-569 SB-3 CPT-39(CLAY) DEPTH: 4.0-8.0'

Remarks:

○ TESTED BY: RM/MJG/JPL
CHECKED BY: MJG
NATURAL MOISTURE: 21.3%
SPECIFIC GRAVITY: 2.64

USCS Particle Size Distribution Report

HULL & ASSOCIATES, INC.

FIGURE NUMBER

H.C. Nutting Company
4120 Airport Road
Cincinnati, Ohio 45226

6/12/98smo

Huii & Associates Inc.
Toledo Tie Treatment Site
Proj. PWM-001
HCN W.O. # 12106.010

TABLE I

TABULATION OF CONSTANT HEAD-FIXED WALL PERMEABILITY TEST DATA

(Test performed per ASTM D-2434)

Lab No.	Boring No.	Sample No.	Depth (Ft.)	Dry Density (Lbs./Ft)	Total Head P.S.I.	Initial(I) Final(F) Natural W.C. %	(K) CM/Sec.	Material Description
4177	98-567	SB-1,BG-1	5-8	98.1	0.86	21.5(I) 21.5(F)	2.7x10-4	FINE SAND Remolded "Tight Condition"
4178	98-568	SB-3,CPT-39	4-8	106.0	5.87	16.3(I) 18.0(F)	2.4x10-6	SILTY SAND,TR ROOTS Remolded "Tight Condition"

prm6-12

H.C. NUTTING COMPANY

Robert L. House,
Vice President/Lab. Director

Hull & Associates, Inc.
3401 Glendale Avenue, Suite 300
Toledo, Ohio 43614
(419) 385-2018
(419) 385-5487 (fax)

LETTER OF TRANSMITTAL

DATE : 08/26/98	HAI Job No. PWM001
SUBJECT: Toledo Tie Treatment Site -	

TO: Ms. Deborah Orr

United States Environmental Protection Agency

77 W. Jackson Boulevard (SE-4J)

Chicago, IL 60606

We are sending you __Reports __Work Order __Specifications
__Invoice __Prints __Change Order _____.
__Copy of letter __Plans

Item	Date	Copies	Description
1	August 98	1	Replacement page 27 of 29 - Time Critical Removal Plan -

These are transmitted as checked below:
__For signature __For review and comment __For approval __As requested X For your use

REMARKS: Deborah,

Attached is a replacement page for 27 of 29 in the report for Toledo Tie we sent you yesterday. Please call if any questions.

Scott

COPY TO: W/ENCLOSURE

Peter Goetz, Goetz Associates	
Ralph Dollhopf, U. S. EPA	

SIGNED: Scott Lockhart

Scott F. Lockhart, P.E.

If enclosures are not as noted, kindly notify Hull & Associates, Inc. at once.

source or water draining from excavated soils or sediments. The City of Toledo WWTP is the preferred receptor of potentially contaminated water from the site and negotiations are ongoing to provide this capacity.

4.4.6 Contingency Plan

The site contingency plan will be amended as needed to address such things as on-site or off-site spills of materials leaving the site, traffic emergencies, etc. The amended plan will be distributed to the parties previously contacted and prior to initiating construction, reviewed with them.

4.4.7 Traffic Plan

ITC will be required to provide a traffic plan which identifies the proposed routing of trucks, staging of equipment, materials, contaminated soils/sediments, etc. and establish a schedule of the number and types of trucks, etc.

4.4.8 Project Schedule and Management Plan

ITC will be required to provide a project schedule which parallels to the degree practicable, the preliminary one shown in Figure 8. Written documentation regarding cost control procedures, project personnel, the chain of command with decision making authority defined, and regular progress reports are to be supplied.

Review of July 1988 Time Critical Work Plan

Proposed remedy:

1. Excavation of approximately 1250 feet of Williams Ditch sediments to a depth of two feet (up to 3.5 feet in some areas). Ditch will be rerouted during construction and the existing siphon dams will remain in place during the construction period.

2. The lagoon area delineated by the investigation will be excavated to 8 feet. The existing infrasturcture (storm sewer) will be removed and replaced with a french drain. Potential migration pathways along the remaining utilities including a 4" gas line, electrical service, underground Ameritech lines, water mains and sanitary sewers, will be addressed by sealing around the pipes/trenches with geosynthetic material or bentonite seals.

3. Approximately 1410 feet of Frenchmens Road will be removed and replaced.

4. A subsurface barrier, a french drain (mentioned above), will be constructed to address residual contamination not removed. The collected storm water will be treated and released to sanitary sewer. Soil sediment will be dispose of off site or adsorption technology will be used.

Question/Comments

- It is not clear how the water collected from the french drain will be treated before discharging to the sanitary sewer.

- The basis for concluding an adequate correlation between the analytical data resulting from the borings and the geoprobe is not presented. An evaluation of the correlation between the analytical data and the CPT/LIF is not addressed at all.

- What are the action levels for the sediments in Williams Ditch and the soils in the lagoon area, they are alluded to in several places but are not listed?

- Soil boring 4 is missing from Plate 2.

Deborah Orr
20July1998

toledo/tcwk1.wpd

DRAFT

MEMORANDUM

To: Deborah Orr, Project Manager
United States Environmental Protection Agency

From: Larry Lueck, START Project Manager
Ecology & Environment, Inc.

Date: 24. July 1998

Re: Comments on the "Time Critical Removal Plan (TCRP)
For the Toledo Tie Treatment Site Located at
ARCO Industrial Park, Toledo, Ohio,"
prepared by Hull & Associates, Inc. (HAI)
for Kerr-McGee Chemical LLC, dated July1998

TDD: S05-9806-012
PAN: 8N1201REXX

Ecology & Environment, Inc. (E & E) has completed review of the above referenced document. This memorandum sets forth our comments and suggestions for improvement of the TCRP.

General Comments:

1. The area immediately surrounding the Spartan warehouse building on the west, south, and southwest should be investigated with LIF and Geoprobe for the EE/CA; from Plate 2 of the TCRP, it appears that subsurface contamination may extend under the building and continue for an unknown distance in those directions.

2. Air monitoring stations and monitoring well locations are both prominently marked on Plates 1 and 2 of the TCRP but there is no discussion of either in the text.

3. It is perplexing that the lagoons are not distinguishable from adjacent soil on the basis of subsurface stratigraphy. Although lagoon limits are marked at the top of each cross section (Plates 3 through 5), stratigraphy is completely uninterrupted across these limits. How should that be interpreted?

Comments by sections and subsections:

page 2

1.2 Site Description

"... warehouse is currently situated over a portion of one of the suspected lagoons."

DRAFT

C: This could be a very important situation but it is not dealt with in the TCRP. Plate 2 shows 1-foot, 3-foot, 5-foot, and 7-foot contamination thickness contours stopping at the north side of this building, indicating that contamination must continue underneath. Five-foot and 3-foot contamination thickness contours trend toward the building from the west but stop before reaching it. Soil sample SB-10, collected at location CPT58 approximately 25 feet north of the building, and soil sample SB-7, collected at location CPT-56 approximately 50 feet west of the building, both show high contaminant concentrations (Table 4). The cross sections on Plates 4 and 5 also show significant contaminant signature thicknesses at these two locations, about 7 feet and 4 feet, respectively. Air photo evidence indicates that this building was constructed over one of the on-site filled lagoons known to be significant sources of subsurface contamination. This problem will have to be addressed in the EE/CA, if not in the time-critical removal.

page 4

"... municipal water supply system ..."

C: For the EE/CA, we will need to know where the municipal wells or surface water intakes are located relative to the site, and the size of drinking water population(s) they serve. It should also be verified that there is "no local use of groundwater for potable consumption."

1.3 Status of Site Removal Activities

page 5

"Field investigations to collect data on ... air at the site were conducted ..."

C: The TCRP should comment on the air monitoring methods that were used and their results, considering that other sample results are reported in detail, and should lay out specific plans for air sampling or monitoring during the time-critical removal.

2.2 Installation of CPT/LIF Borings

page 8 and section 2.2 in general

"Cross sections A-A', B-B', C-C', and D-D', which are shown on Plates 3, 4, and 5, provide an interpretation of shallow stratigraphic conditions encountered at the project area based on data obtained via installation of the CPT/LIF borings."

C: Only 10 of the CPT locations also have Geoprobe soil boring logs of the subsurface stratigraphy. This section should explain how the CPT/LIF by itself can distinguish the soil units used on Plates 3, 4, and 5, with some comment on how reliable this information is.

"..(as appropriate) ..."

C: The intent of this parenthetical expression is unclear.

DRAFT

pages 8-9

"... LIF signatures above background are mostly encountered in the upper sand/silt/clay deposits ..."

C: This evaluation does not appear to be well supported by the cross sections. For example on Plate 3, cross section A-A': in CPT/LIF borings CPT-19, CPT 16 and CPT-11, contamination is shown to extend into the underlying SILT/CLAY unit for distances equivalent to half the total contamination thickness at each point. A similar situation occurs in other borings on this cross section and on cross-sections C-C' and D-D'. Six boring logs on cross section A-A', or 43%, show contamination in the lower SILT/CLAY; on cross sections C-C' and D-D', the corresponding numbers are 44% (four logs) and 17% (one log), respectively. This is important insofar as it might affect the excavation of contaminated materials.

page 10

2.3 Installation of Geoprobe Borings and Test Pits

"...with each sample depth selected from the interval representing the LIF response above background ..."

C: It would have been helpful to include a few analyses of samples collected from stratigraphic intervals immediately below the LIF non-detect level. We still do not know what LIF non-detect equates to in parts per million.

"In general ... was identified)."

C: This sentence is pretty unclear. Names of units like "SILT/CLAY" from the cross sections should be used to avoid confusion.

page 11

"A review of data collected during the initial field investigation indicates that good correlation exists between the CPT/LIF borings, Geoprobe borings and test pits."

C: This evaluation is an opinion and based on very little information. Subsurface stratigraphic detail is displayed on the cross sections of only four CPT locations for which there are also Geoprobe or test pit logs in Appendix C. Another interpretation of the comparison is that:

① the log of SB-9 is in poor agreement with the cross section of CPT-16 on Plate 3;
② the log of SB-7 is in fair agreement with the cross section of CPT-56 on Plate 5, except for overall depth to the SILT/CLAY; the log of TP-6 is in better agreement with CPT-56;
③ the log of TP-2 agrees with the cross section of CPT-38 on Plate 4; and
④ the log of SB-10 is in fair agreement with the cross section of CPT-58 on Plate 4, except for overall depth to SILT/CLAY.

DRAFT

page 12, first paragraph

3.0 RATIONALE FOR TECHNICAL APPROACH

"... the proposed remedy ..."

C: A brief up-front statement in this paragraph of what the proposed remedy is would be helpful.

C: Somewhere between here and the end of the TCRP, there should be some ball-park estimates of cubic yardage and/or tonnage to be removed and treated or disposed of.

page 12, last sentence

"... a direct migration pathway from these areas to the ditch was identified."

C: There should be some discussion, probably in section 2.0, of what this pathway is. This sentence seems to be the first time it is mentioned in the TCRP.

page 14

4.1 Lagoon Excavation and Infrastructure Removal

"... if transportation and disposal ..." "If thermal desorption ..." [underline added]

C: It should be stated what this choice depends on and who will make the choice.

4.1.1 Excavation, Backfill, and Site Grading

"... will be excavated to the subsurface lacustrine clay layer which is at a depth of approximately eight feet." and *"... data show creosote ... rests upon a lower confining layer ..."*

C: See comment under pages 8-9, above, concerning contamination in this "lacustrine clay layer;" also see recommendation under page 10 that the cross section unit name "SILT/CLAY" should be used. Excavating only down to the SILT/CLAY could leave significant contamination in the ground.

C: Sending confirmation samples to a laboratory for DNAPL analysis would seem to be essential but is not mentioned in the TCRP.

page 15

4.1.2 Utility Removal and Replacement

"... service must be maintained to the ... warehouse ..."

C Why? Is the building in use?

"Potential migration pathways ... seal across the utility trench."

C: Will this also be adequate for the EE/CA and the non-time-critical removal?

page 16

4.2.1 Sediment Excavation and Backfill

"... will be backfilled with either general soil fill or lined ..." [underline added]

C: It should be stated what this choice depends on and who will make it.

C: Some discussion is needed of where the sediments will be dewatered and how.

4.2.2 Williams Ditch Rerouting

C: This section needs more explanation, with a figure that gives sufficient detail to show how this is supposed to work.

page 17

4.3.3 Operation

"... and water, once treated ..."

C: Explanation is needed of how, and where on site, contaminated water will be pretreated.

page 19

4.4.5 Dewatering/Stabilization Plan

"... the selected contractor ..."

C: There should be a brief discussion somewhere in the TCRP of what parts of the removal are to be subcontracted, how selection of subcontractor(s) will be done, and so on.

Summary of comments on the Toledo Tie Treatment Removal Action Plan

On July 15, 1998, OSC Ralph Dollhopf requested START review the Removal Action Plan submitted by the potentially responsible party, Kerr-McGee Chemical Corporation, for the Toledo Tie Treatment site. This memorandum summarizes START comments on the previously mentioned document.

Removal Action Plan

Page	Section	Comment
1	1.0	In the second paragraph, should the backup contractor be named? U.S. EPA may need to approve the backup contractor.
8	2.2	Shouldn't the last paragraph talk about maximum depths instead of "maximum thickness" of creosote signatures?
10	2.3	First paragraph, second sentence, should be reworded for clarity.
10	2.3	The first full paragraph discusses elevated parameter concentrations. SB-10 (CPT-58), located in the Spartan Chemical parking lot, exhibits the highest parameter concentrations. Looking at data from other CPT borings, it appears that the odd-shaped impoundment underneath Spartan Chemical and the impoundment underneath Frenchmens Road may be connected.
12	3.0	Bullet 2 at the bottom of the page states "The immediate source...is identified as the two, westernmost lagoons." Proof that the impoundment located underneath the Spartan Chemical building and parking lot is not a source area needs to be provided.
14	4.1	When will a decision be made as far as off-site disposal or thermal treatment. These options should be evaluated.
14	4.1.1	Will excavation continue until the area reaches the visual extent of contamination or just to the proposed lines? Excavation of additional areas should be considered for the time-critical removal action. What will be the purpose of segregating soil? Is segregation of soil feasible, looking at how creosote has migrated to the surface in many areas of the site? Will the separate soil piles/segregation piles be sampled and sent at different levels of contamination?
15	4.1.1	Shouldn't clean backfill be used? Will a composite of proposed "native soils" be collected and analyzed to insure the soil is acceptable for backfill?
16	4.2.1	Is 2 feet deep enough for removal of upstream sediment? Are the 2 feet and 3.5 feet depths for sediment removal just guides? All sediment should be removed unless it is not contaminated. Two feet or 3.5 feet can be an estimate for disposal options/cost projections. The City of Toledo's Comprehensive Ditch Plan should be attached for review.
16	4.2.2	How will rerouting water in Williams Ditch be achieved? This should be stated in the plan for evaluation.

Page	Section	Comment
17	4.3.3	What sampling or other information does the City of Toledo require for discharge?
19	4.4.4	Air monitoring plan action levels should be available for review before work begins on site.

Appendix C

Geoprobe and Test Pit Logs — PID/FID readings detected during Geoprobe soil borings and test pit excavating activities should have been indicated on the Geologic Drill Logs. TP-5 has a comment

Appendix E — There is no reference or discussion in the text concerning Appendix E and its relativity to the plan.

Plan Set — Storm sewer numbers should be included on sheet 3 for the areas of the sewer to be removed.

Did you see PM-10